EPA/ROD/R03-95/195
1995

EPA Superfund
Record of Decision:

CENTRE COUNTY KEPONE
EPA ID: PAD000436261
OU 01
STATE COLLEGE BOROUGH, PA
04/21/1995

Text:

RECORD OF DECISION
CENTRE COUNTY KEPONE SITE

DECLARATION

SITE NAME AND LOCATION

Centre County Kepone Site
State College, Pennsylvania

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the first operable unit ("OU1") at the Centre County Kepone Site located in State College, Centre County, Pennsylvania. This document was developed in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the remedial action for this Site. The information supporting this decision is contained in the Administrative Record for this Site.

The Commonwealth of Pennsylvania concurs with the selection of this remedy.

ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, that actual or threatened releases of hazardous substances from this Site, as discussed in "Summary of Site Risks", Section 6.0, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The Centre County Kepone Site consists of 32.3 acres housing the Ruetgers-Nease Corporation, which is an active chemical manufacturing facility, and a portion of the Spring Creek watershed. This operable unit is the first of two operable units for the Site. The remedial action for OU1 will address contaminated groundwater, surface water, soils, and sediments, source control measures for surface water discharges, and additional soil/sediment sampling of the 15-acre Former Spray Field Area and riparian areas of Spring Creek. The groundwater and Thornton Spring surface water contamination represent a significant threat. Therefore, remediation of contaminated groundwater will be required. Soils and sediments onsite represent a principal threat that may potentially impact groundwater quality; therefore, an excavation and offsite disposal remedy for source control will be required.

The major components of the Selected Remedial Action for OU1 are as follows:

- Extraction and treatment of contaminated groundwater with discharge to the freshwater drainage ditch;
- Long-term groundwater monitoring;
- Excavation and offsite disposal of contaminated soils;
- Surficial Soil Sampling of the 15-acre Former Spray Field Area and the calculation of environmental risks;
- Improvements to the surface water drainage system in the plant production area;
- Engineering controls and hazardous materials management practices for surface water drainage;
- Monitoring of surface water discharge from the Site;
- Excavation and offsite disposal of contaminated sediments;
- Fish tissue and stream channel monitoring;

! Onsite and offsite fencing;

! Deed restrictions; and,

! Riparian-area Sampling, including the drainage channel of Thornton Spring, Section B of the freshwater drainage ditch, and downstream of Benner Fish Hatchery, and calculation of environmental risks.

The second operable unit ("OU2") will address the soils from the riparian-areas of Spring Creek and the 15-acre former spray field area, and sediments from the lower portion of the freshwater drainage ditch and Thornton Spring. EPA's decision regarding OU2 will be presented in a future ROD after the additional data has been collected and analyzed from these areas.

It may become apparent during implementation or operation of the groundwater extraction system and its modifications, that contaminant levels have ceased to decline and are remaining constant at levels higher than the performance standards over some portion of the area of attainment. If EPA, in consultation with the Commonwealth of Pennsylvania, determines that implementation of the selected remedy demonstrates, in corroboration with hydrogeological and chemical evidence, that it will be technically impracticable to achieve and maintain the performance standards throughout the entire area of attainment, EPA, in consultation with the Commonwealth of Pennsylvania may require that any or all of the following measures be taken, for an indefinite period of time, as further modification(s) of the existing system:

a) long-term gradient control provided by low level pumping, as a containment measure;

b) chemical-specific ARARs may be waived for those portions of the aquifer for which EPA, in consultation with the Commonwealth of Pennsylvania, determine that it is technically impracticable to achieve such ARARs;

c) institutional controls may be provided/maintained to restrict access to those portions of the aquifer where contaminants remain above performance standards; and

d) remedial technologies for groundwater restoration may be reevaluated.

The decision to invoke any or all of these measures may be made during implementation or operation of the remedy or during the 5-year reviews of the remedial action. If such a decision is made, EPA shall amend the ROD or issue an Explanation of Significant Differences, as necessary.

STATUTORY DETERMINATIONS

The selected remedies are protective of human health and the environment; comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action; and are cost-effective. These remedies utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because these remedies will result in hazardous substances remaining at the Site, a review by EPA will be conducted within five years after the initiation of the remedial action, and every five years thereafter, as required by Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), to ensure that the remedies provide adequate protection of human health and the environment.

Thomes C. Voltaggio, Director   Date
Hazardous Waste Management Division
Region III

RECORD OF DECISION
CENTRE COUNTY KEPONE SITE

TABLE OF CONTENTS

RECORD OF DECISION
CENTRE COUNTY KEPONE SITE

DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The Centre County Kepone Site ("the Site") consists of an approximate 32.3 acre property housing the Ruetgers-Nease Corporation, an active chemical manufacturing facility, and a portion of the Spring Creek watershed1. The Ruetgers-Nease facility is located in College Township, Centre County, Pennsylvania. The Site is situated on Struble Road off of Pennsylvania State Highway 26 approximately 2¼ miles northeast of the Borough of State College and 800 feet south of the intersection of Pennsylvania State Highways 26 and 150. The Centre County Kepone Study Area ("the Study Area") includes Thornton Spring and that portion of Spring Creek from the Village of Lemont (where Thornton Spring is located) to the Pennsylvania Fish Commission (PFC) Benner Spring Research Station. (See Figure 1).

The Ruetgers-Nease facility is adjacent to the southeastern side of a local Pennsylvania Railroad spur. A variety of facility buildings and structures presently occupy the northern portion of the Site which is mostly covered by asphalt pavement and concrete. These buildings and structures include processing buildings, storage buildings, a tank farm, a groundwater treatment facility, and an administrative building. The southern and southwestern portions of the facility are primarily grassed areas not currently used in the manufacturing operations. A freshwater drainage ditch, which receives limited storm water runoff and treated water from the groundwater treatment facility, runs along the western boundary of the Site, crosses under PA 26, and enters Spring Creek immediately downstream from PA 26. (See Figure 2).

The area immediately surrounding the Site is a combination of commercial/industrial, retail, and residential properties. Just north of the Pennsylvania Railroad spur is a lumber and construction supply warehouse. Northwest of Route 26 are a variety of retail stores and restaurants. Immediately southwest of the Site is a concrete manufacturer, an automobile salvage

1- The "Site" is defined as all areas impacted by contaminants originating from the Ruetgers-Nease plant, and currently includes all of the plant area, the area underlain by impacted groundwater, Thornton Spring, and Spring Creek from the Village of Lemont to the Pennsylvania Fish Commission Research Station.

yard, and gasoline service stations. Southeast of the Ruetgers-Nease administration building, along Struble Road and Clyde Avenue, is an automobile repair shop and a small manufacturing facility. Residential dwellings are located along the southeast side of First Avenue. Land use in the Study Area is primarily agricultural and recreational. According to the Centre County Regional Planning Commission, the 1990 population in College Township was 7,620, with a projected population of 8,400 by 1995. Public water is supplied throughout the surrounding area by the Lemont Water Company.

Surface features of the Study Area include Nittany Mountain, which rises to the southeast of the Site, and Bald Eagle Mountain which rises across Nittany Valley to the northwest of the Site. Spring Creek meanders generally northward through the Study Area and Nittany Valley. Nittany Valley ranges in elevation from 800 to 1,200 feet above mean sea level (MSL), while Nittany Mountain rises to approximately 2,070 feet, MSL.

The primary media of concern at the Site and Study Area are contaminated groundwater, surface water, soils, sediments, and fish tissue which present both a carcinogenic and non-carcinogenic risk to human health. Benzene, 1,2-dichloroethene, ethylbenzene, tetrachloroethane, tetrachloroethene, toluene, trichloroethene, vinyl chloride, xylenes, and mirex are the chemicals which contribute most to potential future carcinogenic and non-carcinogenic risks.

There are also potential risks to ecological receptors at the Site and Study Area. Levels of mirex and kepone in soil of the former spray field area, and sediments of the drainage ditch, Thornton Spring, and Spring Creek exceed the criteria that EPA has determined are protective of ecological receptors. However, these areas were not fully characterized during the RI/FS process and will require further investigation to determine the extent of contamination and potential risks to ecological receptors.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

From 1958 through 1977, the 32.2 acre Site was owned and operated by Nease Chemical Company, Inc. (Nease Chemical or Nease). As of December 30, 1977, Nease Chemical Company, Inc. including the Site, was acquired by and merged with Ruetgers Chemicals, Inc. The company resulting from the merger is Ruetgers-Nease Chemical Company, Inc. (Ruetgers-Nease). Ruetgers-Nease has owned and operated the Site continually since December 1977.

Since the beginning of operations at the Site in 1958, a variety of organic chemicals have been produced, many with specialized applications, including products and intermediates utilized in the soap and detergent industry, in the manufacture of pharmaceutical products, in the agricultural chemical industry, in metal plating, and in the manufacture of plastics. The primary organic raw materials used in the production of intermediates and products include, but are not limited to, benzene, methanol, perchloroethylene, tetrachloroethane, toluene, and xylene.

Two organic compounds of particular interest which were manufactured as custom products at the Ruetgers-Nease facility are kepone (chlordecone) and mirex (dodecachloropentacylodecane). Kepone was produced at two different time periods between 1959 and 1963. Mirex was manufactured at the facility from 1973 through 1974.

In the early 1960's, Nease began onsite waste disposal by utilizing earthen lagoons. On February 22, 1960, Nease was notified that a chemical odor was emanating from Thornton Spring. As a result, an inspection was conducted by the Pennsylvania Department of Health (renamed the Pennsylvania Department of Environmental Resources (PADER) in 1971) on June 10, 1960 which indicated that the lagoons may be the cause of the spring odor. As a corrective action, a concrete lagoon was constructed in 1962 and in 1963 an earthen lagoon was macadamized with asphalt. These lagoons served as combined neutralizing and settling basins, where lime was added to the wastewater. The treated water was then sprayed on an open grassy area at the southern end of the Site identified as the Former Spray Field.

During 1969, several investigations of Site geology and dye tests were conducted by PADER to determine if water infiltrating from the spray field was impacting the water discharging at Thornton Spring. Investigations revealed that the spring waters were impacted by the spray field. PADER recommended the spray field be discontinued and requested Nease to schedule actions to prevent further discharges to Thornton Spring. Soon after, Nease complied with this recommendation.

In May 1972, following a bioassay of the water in the lagoons, PADER ordered Nease to perform in-situ treatment of the wastewater and sludge in the concrete and earthen lagoons using a process called Chemfix. In addition, PADER ordered that the contents of the asphalt impoundment be disposed of and the asphalt and earthen impoundments backfilled. Nease complied with PADER's requirements for waste treatment and disposal by November 1972, and subsequently backfilled the asphalt and earthen lagoons. Since April 1972, Nease and Ruetgers-Nease have disposed of waste materials at offsite disposal facilities.

In November 1977, PADER issued an Administrative Order to Nease for the preparation and submittal of a plan to investigate potential environmental impacts at the Site and to abate discharges of industrial wastes.

Numerous subsequent investigations were carried out at the Site and Study area from the mid-1970's through the 1980's by various State and Federal agencies, Nease, and Ruetgers-Nease. Based on the findings of the investigations, PADER issued a Supplemental Order to Ruetgers-Nease in June 1981. The Supplemental Order required Ruetgers-Nease to remove and dispose of contaminated soil and solid waste material from the chemfixed lagoons and the former drum storage area, to restore the groundwater contaminated with organic chemicals and solvents and to conduct extensive groundwater monitoring to determine the effectiveness of the cleanup and the presence of any other contaminants.

In August 1981, Ruetgers-Nease submitted a plan for groundwater rehabilitation to PADER followed by an application for approval to construct and operate a groundwater treatment facility. PADER granted approval for the construction of the groundwater treatment facility in April 1982. Ruetgers-Nease initiated construction in October 1982, and commenced operations in November 1982.

In June 1982, Ruetgers-Nease submitted an engineering plan to PADER for removal of Chemfix material. Excavation and removal of the Chemfix material was initiated in October 1982. In July 1983, Ruetgers-Nease submitted a closure proposal for the former Chemfix lagoons, which was approved by PADER in September and by EPA in October of 1983.

EPA proposed the Site for inclusion on the National Priorities List (NPL) on December 1, 1982 and placed it on the NPL on September 8, 1983.

In October 1985, PADER issued a notice letter to Ruetgers-Nease requesting a Work Plan for conducting a Remedial Investigation/Feasibility Study ("RI/FS") at the Site. In May 1986, while discussions concerning the content of the Work Plan were pending, oversight of cleanup activities under CERCLA were transferred from PADER to EPA.

On March 9, 1988, a Special Notice Letter was issued to Ruetgers-Nease advising the company of their potential liability for CERCLA response actions at the Site. In November 1988, Ruetgers-Nease entered into an Administrative Order on Consent (AOC) with EPA whereby Ruetgers-Nease agreed to perform an RI/FS with EPA oversight. Based on the findings of previous investigations, a Remedial Investigation Site Operations Plan (RISOP) was written which detailed the scope of work for the RI. Phase I of the RI was conducted between

September 1990 and July 1991, and Phase II was conducted between October 1991 and May 1992. The Final RI Report, which included the Baseline Risk Assessment, was submitted to EPA in December 1992.

The RI and FS Reports were conditionally approved on March 26, 1993 and September 27, 1994, respectively. EPA developed the Proposed Remedial Action Plan ("Proposed Plan") for the Site based on the findings of the RI and FS Reports.

On October 3, 1994, EPA released the Proposed Plan for the Site and provided a 30-day public comment period ending November 1, 1994. A request for 30-day extension of the comment period was granted by EPA and public comments were accepted until December 1, 1994.

Based on comments received during the public comment period, EPA revised the Proposed Plan to include cleanup levels for soil and sediment. The public comment period was reopened for 30 days beginning on January 27, 1995 and ending on February 25, 1995.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Community interest and concern about the Site has been steady throughout EPA involvement. EPA and the State conducted an initial public meeting in State College, Pennsylvania on September 11, 1990 to inform residents of the cleanup process and activities which would take place at the Site. On September 6, 1991, a Technical Assistance Grant ("TAG") of $50,000 was issued to a local citizens' group for the purpose of hiring an independent technical consultant to assist the group in understanding and commenting on technical documents for the Site. However, the grant was terminated on August 15, 1992 because the TAG recipient was dissolved. EPA issued a Fact Sheet which provided the results of the Phase I Remedial Investigation and outlined Phase II activities in May of 1992.

Pursuant to CERCLA § 113(k)(2)(B)(i)-(v), the RI/FS reports and the Proposed Plan for the Centre County Kepone Site were released to the public for comment on October 3, 1994. These documents were made available to the public in the Administrative Record located at the EPA Docket Room in Region III's Philadelphia office, and the Schlow Memorial Library in State College, Pennsylvania. The notice of availability of these documents was published in the Centre County Times on October 3 and October 17,1994.
A public comment period on the documents was held from October 3, 1994 to November 1, 1994. A request for a 30-day extension to the public comment period was made on October 27, 1994. As a result, the closing date for the public comment period was extended to December 1, 1994. In addition, a public meeting was held on October 19, 1994. At this meeting, representatives from EPA answered questions about conditions at the Site and the remedial alternatives under consideration.

Based on comments received during the public comment period, EPA revised the Proposed Plan to include cleanup levels for soil and sediment. A public comment period on the revised Proposed Plan was held from January 27, 1995 to February 25, 1995. The notice of availability of the revised Proposed Plan was published in the Centre County Times on January 27 and 28, 1995. The responses to all comments received during the public comment periods are included in the Responsiveness Summary, which is part of this Record of Decision ("ROD").

This decision document presents the selected remedial action for the first operable unit ("OU1") at the Centre County Kepone Site in State College, Pennsylvania, chosen in accordance with CERCLA, SARA, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. The selection of the remedial action for this Site is based on the Administrative Record.

4.0 SCOPE AND ROLE OF RESPONSE ACTION

The Centre County Kepone Site has been divided into two operable units (OUs), or site components, in order to simplify and expedite action at the Site. OU1 will address the contaminated groundwater and surface water, contaminated soils (excluding the 15-acre Former Spray Field Area) and sediments on the Ruetgers- Nease property, and the sediments in Spring Creek. These media also pose some of the principal threats to human health and the environment from the Site. OU2 will consist of remedy selection for soils from the riparian-areas of Spring Creek and the 15-acre Former Spray Field Area, and sediments from the lower portion of the freshwater drainage ditch and Thornton Spring. This approach to remediation will allow for expedited action to address the health threats while further study of soil and sediment cleanup alternatives is completed.

The remedy for OU1 will comprehensively address the threats posed by the release of hazardous substances at the Site. The principal threats posed by the Site are due to VOC contamination in the groundwater and surface water, mirex in fish tissue, and mirex and VOC contamination in soils and sediments. The groundwater aquifer is classified as a Class I aquifer - Special Ground Water. This designation is for groundwater of particularly high value since this aquifer is highly vulnerable to contamination and is ecologically vital. The primary risks to human health and the environment are from: 1) ingestion and inhalation of, and dermal contact with groundwater from wells that contain contaminants above the Maximum Contaminant Levels ("MCLs") established by the Safe Drinking Water Act ("SDWA"); 2) ingestion of fish from Spring Creek containing mirex and kepone above FDA action levels; and, 3) ingestion of and dermal contact with soils. Soils at the Site are also highly contaminated with VOCs and therefore, represent a principal threat due to the potential for the VOCs to migrate into the groundwater. In addition, the levels of mirex and kepone in sediment samples in the freshwater drainage ditch represent a potential threat to the environment since they are greater than literature levels indicative of ecological effects. Consequently, EPA plans to address these threats by meeting the following goals: 1) to restore contaminated groundwater to its beneficial use and to background levels; 2) to mitigate or prevent leaching of contaminants from soils and sediments to groundwater; 3) to protect environmental receptors; and, 4) to control surface water quality at the Site.

The first goal, to restore the groundwater to its beneficial use and to background levels, will be accomplished by extracting the contaminated groundwater, treating it with a granular activated carbon ("GAC") adsorption system, and discharging the treated effluent to the onsite drainage ditch. This goal will be further met by the second goal which will be accomplished by excavating contaminated sediments and soils. The purpose of this action is twofold: 1) it will prevent the transport of soil and sediment contaminants into the groundwater in order to protect groundwater for its beneficial uses and meet applicable or relevant and appropriate requirements ("ARARS") for the groundwater, and 2) it will protect environmental receptors in those areas where environmental risk was demonstrated.

Treatment of contaminated groundwater and removal of the contaminated sediments and soils will assist in accomplishing the third goal of protecting environmental receptors. OU2 will further enhance this goal by addressing the final response actions for soils from the riparian-areas of Spring Creek and the 15-acre Former Spray Field Area, and sediments from the lower portion of the freshwater drainage ditch and Thornton Spring. This decision will be made after further studies are completed for these areas.

The last goal, to control surface water quality at the Site, will be met by source control measures. The purpose of this action is to eliminate groundwater containing contaminants from entering the onsite drainage ditch. This goal will be accomplished by making improvements to the existing surface water drainage system and implementing a surface water drainage control plan and a hazardous materials management practices program.

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 Surface Features, Geology, Soils, Hydrogeology, Hydrology

Surface Features and Resources. The Study Area lies within the Spring Creek basin in south-central Centre County. Surface features include Nittany Mountain, which rises to the southeast of the Site and Bald Eagle Mountain which rises across Nittany Valley to the northwest of the Site. Spring Creek meanders generally northward through the Study Area and Nittany Valley. Nittany Valley ranges in elevation from 800 to 1,200 feet above mean sea level (MSL), while Nittany Mountain rises to approximately 2,070 feet, MSL. In this locale, topography is aligned in a prominent southwest to northeast direction, reflecting the influence of underlying geologic structure and rock types.

The Site includes paved and grassed areas, and buildings and ancillary facilities operated by Ruetgers- Nease Corporation. The southern and southwestern portions of the Site are primarily grassed areas not currently used in the chemical manufacturing operations.

A freshwater drainage ditch runs along the western boundary of the Site, crosses under PA Route 26, and enters Spring Creek immediately downstream from PA Route 26. This ditch is appropriately characterized as an intermittent drainageway with minimal bankside vegetation. The banks of the ditch are moderately-steep and the streambed itself is confined to the central part of the ditch. Bankside vegetation is almost entirely restricted to herbaceous plants. Sediments in the onsite portions of the ditch are sands and silts with very little organic carbon, while the downstream section adjacent to PA Route 26 is alternately composed of unconsolidated cobble and sand, and exposed bedrock. Stream flow in the freshwater drainage ditch is dependent upon both stormwater runoff and discharges from the Site groundwater treatment facility.

Thornton Spring lies to the southwest of the Site. Thornton Spring is a perennial first-order stream that originates from a groundwater seep at the southern end of Nittany Mountain. Thornton Spring flows approximately 300 feet before emptying into Spring Creek through a culvert under Pike Street immediately upstream from PA Route 26. The streambed of Thornton Spring is two to four feet wide, comprised of unconsolidated sand, gravel, and cobble, and contains relatively little organic carbon. Land immediately adjacent to Thornton Spring is forested by hardwoods and a few shrubs, and the lawn of an adjacent private residence borders the stream before it goes through the Pike Street culvert and into Spring Creek.

The Spring Creek portion of the Study Area includes Spring Creek and its riparian zone (i.e., floodplain).

Spring Creek is a natural (versus channelized), approximately third-order cold water stream with a riparian zone that is alternately forested and maintained as residential lawns. The canopy over Spring Creek at this location covers 30-40 percent of the stream. Sediments in the streambed are composed primarily of sand, gravel, and cobble; a substantial amount of particulate organic material (i.e., leaf packs, woody debris) is also found.

In addition to fish, waterfowl, and other animals closely tied to Spring Creek and its tributaries as well as a wide variety of terrestrial plants and animals inhabit the Spring Creek basin. For the Spring Creek watershed upstream of Bellefonte, there are thirty-six (36) plants and animals listed as "Species of Special Concern" by the Pennsylvania Natural Diversity Inventory (PNDI) The PNDI listing is inclusive of all federally listed rare, threatened or endangered species. Of the 36 species of special concern identified by PNDI, four (4) plants are confirmed to be present within five (5) miles of State College. These include the Geyer's Sedge (Carex geyeri, endangered), lupine (Lupinus perennis, rare), low serviceberry (Amelanchier humilis, tentatively undetermined), and gay-feather (Liatris scariosa var. nieuwlandii, tentatively undetermined). No rare, threatened, or endangered animal species were identified by PNDI as residing within five miles of State College.

With the exception of occasional transient species, there are no federally listed or proposed threatened or endangered species within the Study Area.

A review of the Historic Resources of Centre County (Centre Regional Planning Commission, 1982) document was conducted to determine if historic buildings, structures, or sites were present within a one mile radius of the Site and Study Area. No sites are identified within a one-mile radius of the Ruetgers- Nease manufacturing plant. Eight sites were identified along Houserville Road or within the vicinity of Spring Creek in the Study Area.

Geology. The Site and Study Area are located in the Valley and Ridge Physiographic Province of the Appalachian Mountains in Central Pennsylvania. This region is characterized by a series of alternating elongated, high ridges and broad valleys trending southwest to northeast. This province is characterized by tightly folded and faulted sedimentary rocks that have been uplifted and subsequently eroded. Limestone of the Site has developed solution features typical of karst terrane.

The geologic units underlying the Site are represented by a structurally duplicated sequence of carbonate rocks of Ordovican age comprising the Loysburg Group and Bellefonte Dolomite. The Bellefonte Dolomite, comprised in the Site vicinity by the Tea Creek and Dale Summit Members, is the lowest stratigraphic unit observed within the limit of investigation. The Tea Creek Member consists of a medium-light gray, cryptocrystalline dolomite that varies from finely laminated to massive. The Dale Summit Sandstone Member occurs below the Tea Creek Member and is characterized as a fine to coarse grained conglomerate sandstone.

The Loysburg Group overlies the Bellefonte Dolomite. The Loysburg Group consists of interbedded dark gray limestone, dolomitic limestone and minor dolomite.

The bedrock beneath the Site lies within the northwest limb of the Nittany Mountain syncline. Bedding planes strike northeast-southwest, and dip approximately 25 degrees to the southeast toward the axis of the syncline. A thrust fault, apparently related to the later stages of the Nittany syncline folding event, parallels the bedding strike through the Site. The faulting is responsible for the structural duplication of the major rock units on site.

Soils. The specific soil types identified onsite are the Murrill gravelly loam, and urban land soils. Two soils within the Murrill channery silt loam on 3 to 8 percent slopes (MuB) and the Murrill channery silt loam on 8 to 15 percent slopes (MuC) are reportedly formed from sandstone colluvium and weathered residue from underlying limestone. These soils consist of deep, well-drained soils usually situated on level to moderately steep slopes along the edges of the limestone valleys.

The urban land soils are soils that have been altered by excavation, removal, and filling activities. Urban lands soils exist within most of the fenced/developed areas of the Site.

Depth to bedrock at the Site is variable and typically more than 6 feet. Soil thickness was found to be as much as 25 feet in the plant production area.

Hydrogeology. Groundwater movement at the Site occurs as conduit and diffuse flow. Conduit flow occurs along bedding-plane partings and fractures enlarged by solutioning. Diffuse flow is through the rock matrix. Groundwater storage in bedrock occurs in both the primary porosity of the rock matrix and secondary porosity, enhanced by solutioning. Dissolution features are more strongly developed in the limestone of the Loysburg Group than in the Bellefonte Dolomite. The dominant conduit flow is along the fault which bisects the Site and brings the dolomite east of the fault in contact with the limestone to the west. High hydraulic conductivity, or permeability along solutioned zones, functions as a drain for the groundwater system;

surrounding diffuse flow zones tend to drain toward the conduit flow zone.

Residual soil overlies the bedrock at the site. Saturation generally occurs 8 to 10 feet below ground surface. The soil is not considered an aquifer. The bedrock, where permeable, drains soils by vertical flow. Lateral flow at the soil-bedrock interface occurs at competent bedrock, until flow reaches a weathered or fractured zone. Soil permeability is too low for soil to completely drain, creating a saturated (perched) zone in the soil overburden.

Groundwater from the Site generally flows toward the southwest, along a thrust fault which runs northeast to southwest through the Site. Groundwater flow for the bedrock aquifer, appears to be controlled by solution cavities and fracture systems. Solution cavities, or a fracture system appears to be directing shallow groundwater from the plant area and the geologic contact into a slightly deeper groundwater zone at the center of the Site. Groundwater conduit flow moves from the Site towards the southwest, where it emerges as surface water at Thornton Spring. Deeper regional groundwater flow systems have not been evaluated.

Site Drainage. Site surface drainage via overland flow is primarily directed by surface drains to the freshwater drainage ditch along the western boundary of the Site. Surface water leaves the Site via the freshwater drainage ditch which also includes treated water from the groundwater treatment facility. The freshwater drainage ditch crosses under and follows PA Route 26 in a southwesterly direction until it intersects Spring Creek.

5.2 Nature and Extent of Contamination

In accordance with the Consent Order signed in 1988, Ruetgers-Nease performed a RI/FS to assess the nature and extent of contamination at the Site. They also performed a Risk Assessment in order to evaluate the human health risks and the environmental impacts associated with exposure to Site contaminants.

The nature and extent of contamination at the Site was characterized by sampling surface soils, subsurface soils, sediments, surface water, groundwater monitoring wells, ambient air, and fish tissue.

5.2.1 Groundwater

Four separate groundwater sampling events were conducted during the two phases of the RI. These sampling events were designated as Rounds 1, 2, 2A, and 3. Fifteen wells and one sump were sampled during Round 1. The groundwater samples were analyzed for Target Compound List (TCL) volatile organics, mirex, and kepone. During Round 2, seven wells were sampled for the same list of analytes. Two wells were sampled during Round 2A, and were analyzed for TCL volatile organics. Round 3 included sampling fifteen wells. Eight wells were sampled for TCL volatile and seven well samples were analyzed for TCL volatile, mirex, and kepone. Figure 3 identifies the location of existing and new groundwater monitoring wells.

More than 20 different volatile organic compounds (vocs) including mirex and kepone, were detected in groundwater from the monitoring wells, including several at concentrations that exceed Maximum Contaminant Levels (MCLs) for public drinking water supplies. The contaminants that are of greatest concern from a human health perspective are benzene, 1,2-dichloroethene, ethylbenzene, tetrachloroethene (PCE), toluene, trichloroethene (TCE), vinyl chloride, and xylenes. Mirex and kepone were also detected in some of the groundwater samples. Figures 4 and 5 indicate the results of sample analyses for Rounds 1/2, and 2A/3, respectively. Table 1 provides a summary of the groundwater sampling results.

The analytical results indicate that volatile organic compounds are present in groundwater beneath the facility. The highest levels of VOCs detected during the groundwater investigation were in the two (2) wells located adjacent to the Tank Farm/Building No. 1 area (MW-21S and MM-23S). Total VOCs in MW-21S were 306,400 micrograms per liter (:g/l) during Round 1 and 222,000 :g/l during Round 2. Total VOCs in MW-23S were 409,000 :g/l during Round 1. Generally, total VOC concentrations in groundwater decrease with distance from this area.

The highest concentration of benzene detected in the groundwater was 18,000 :g/l in MW-23S. Benzene was also detected in other monitoring wells further downgradient of MW-23S, at lower concentrations, but still above MCLs. The concentrations of 1,2-dichloroethene detected in monitoring wells ranged from 19,000 :g/l in MW-21S to 3 :g/l in MW-38D. Ethylbenzene was detected at a maximum concentration of 16,000 :g/l in MW-23S. PCE was detected in 13 of 39 samples with concentrations ranging from 6,400 :g/l in MW-21S to not detected. The highest concentration of toluene detected in the groundwater was 190,000 :g/l in MW- 23S. The concentration of TCE detected was the highest in MW-21S at 78,000 :g/l. Vinyl chloride was detected at 330 :g/l in MW-4OD, which is located near Building 8. Xylene concentrations detected in the monitoring wells ranged from a maximum of 92,000 :g/l in MW-23S to not detected. The contaminants and their respective MCLs are summarized in the table on the following page.

The highest concentrations of mirex and kepone detected during the groundwater investigation were 0.145 :g/l and 1.41 :g/l. These levels were found in wells MW-22S and MW-7D, respectively.

Certain VOC constituents detected in wells adjacent to the Tank Farm and the Production Area were present at concentrations greater than 10 percent of the water solubility of the constituent, indicating the possibility of dense non-aqueous phase liquids (DNAPLS). DNAPLS may be contained within the cavities and fractures of the karstic bedrock.

5.2.2 Thornton Spring

Thornton Spring and its associated drainage channel to Spring Creek exhibit turbulent and variable flow. The drainage channel consists of gravel, cobbles, and boulders lying on the bedrock surface at places, and small amounts of finely grained sediments. Flow rates at Thornton Spring vary greatly and have been reported to be as high as 3,280 gpm and as low as 38 gpm.

Summary of Groundwater Sampling Results
at the Centre County Kepone Site

Chemical	Concentration Detection Frequency	Maximum Monitoring Observed (:g/l)	SDWA Well Observed
VOLATILE ORGANIC COMPOUNDS			
Benzene	16/39	18,000	MW-23S
1,2-Dichloroethane	2/39	6	MW-7D
1,2-Dichloroethene	17/39	19,000	MW-21S
Ethylbenzene	13/39	16,000	MW-23S
Tetrachloroethene	13/39	6,400	MW-21S
Toluene	17/39	190,000	MW-23S
Trichloroethene	20/39	78,000	MW-21S
Vinyl Chloride	11/39	330	MW-40D
Xylenes	17/39	92,000	MW-23S
PESTICIDES			
Kepone	7/31	1.41	MW-7D
Mirex	10/33	0.145	MW-22S

*

- Indicates where the highest contaminant concentrations were detected.

5.2.2.1 Thornton Spring Surface Water

Four surface water samples were collected from Thornton Spring and the drainage channel that leads to Spring Creek at the locations shown on Figure 6. Surface water samples TS-1, TS-2, TS-3, and SW-4 were analyzed for TCL VOCs. In addition, SW-4 was analyzed for mirex and kepone. VOCs were detected in all surface water samples with the highest concentrations in the upstream locations. The total VOCs concentration ranged from 837 micrograms per liter (:g/l) to 2,927 :g/l. Specific VOCs detected in surface water included 1,2-dichloroethene, ethylbenzene, 1,1,2,2-tetrachloroethane, toluene, trichloroethene, and xylene. Mirex and kepone were detected in SW-4 at concentrations less than 0.01 :g/l and 1.0 :g/l, respectively. Table 2 provides a summary of the surface water sampling results from Thornton Spring, and includes the freshwater drainage ditch, and Spring Creek.

5.2.2.2 Thornton Spring Sediment

One sediment sample (SED-4) was collected from the Thornton Spring drainage channel immediately upstream from its confluence with Spring Creek and analyzed for VOCs, mirex, and kepone. Specific VOCs detected include 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2-dichloroethane, and trichloroethene. The total VOC concentration was 1,807 micrograms per kilogram (:g/kg). Mirex and kepone were also detected at concentrations of 626 :g/kg and 750 :g/kg, respectively. Table 3 provides a summary of sediment sampling results from Thornton Spring, and includes the freshwater drainage ditch, and Spring Creek.

5.2.2.3 Thornton Spring Air

Air samples were collected on two separate days at three locations surrounding the Thornton Spring discharge pool and at one location along Pike Street. See Figure 6 for the sampling locations. Each sample was analyzed for VOCs. Levels of total VOCs for samples closest to the mouth of Thornton Spring (A1, A2, A3) ranged from 43.0 micrograms per cubic meter (:g/m3) to 90.8 :g/m3 during the first round of sampling, while the total VOCs ranged from 74.3 :g/m3 to 390.7 :g/m3 during the second round. Air sample A4, which was approximately 200 feet from Thornton Spring, had significantly higher levels of total VOCs during the first round (1,541 :g/m3) than during the second round (247 :g/m3). The higher levels of VOCs in the first round air sample A4 was due to construction activities upwind of the sampling station.

5.2.3 Onsite Soils

A Site-wide soil gas survey was implemented as a screening tool to determine relative concentrations of volatile organic compounds (VOCs) in the shallow subsurface soils. Information obtained from the soil gas survey was used to establish the surface soil sampling and discrete-depth soil boring locations. Over 350 soil gas measurements were taken at the 18-inch depth and approximately 120 soil gas measurements were taken at the 31-inch depth. Readings were measured with a photoionization detector (PID) and a flame ionization detector (FID). The detection limits for both instruments were 0.5 parts per million (PPM) of total volatile organic compounds. Neither instrument had the ability to identify individual compounds in the soil gas.

5.2.3.1 Onsite Surface Soils

Eleven surface soil samples were collected during the remedial investigation: two samples were analyzed for VOCs, mirex, and kepone; seven were analyzed for mirex and kepone; and two were analyzed for VOCs.

The highest concentration of total VOCs was detected in the Former Drum Staging Area at a concentration of 27 micrograms per kilogram (:g/kg). The specific compounds detected in the sample included TCE, PCE, and toluene. Mirex was detected in all nine samples at concentrations ranging from 32 :g/kg in the Former Spray Field Area to 4,770 :g/kg in the Tank Farm/Building No. 1 Area. Kepone was detected in eight of the nine samples collected. Concentrations ranged from 23 :g/kg in the Former Spray Field Area to 1,710 :g/kg in the Former Drum Staging Area near Building No. 9. See Figure 7 for the locations and sampling results for Phase I and II surface soil samples. Table 4 provides a summary of all specific compounds detected in surface soils.

5.2.3.2 Onsite Subsurface Soils

Sixteen soil borings were advanced to bedrock during the RI to characterize the extent of subsurface soil impacts and to augment the data collected during the surficial soil sampling program. One to three samples were collected at varying depths from each boring, and were analyzed for VOCs, mirex, and kepone.

VOCs were detected in fifteen samples, with total VOC concentrations ranging from 2 micrograms per kilogram (:g/kg) to 2,376,110 :g/kg. The maximum concentration of VoCs was detected at a depth range of 222 inches to 234 inches below ground surface in the area adjacent to the Tank Farm Area (SB-3C). Mirex was detected in 32 of the 34 samples with concentrations ranging from 0.63 :g/kg to 42,300 :g/kg. The maximum concentration of mirex was detected in the Designated Outdoor Storage Area at a depth of 42 inches to 60 inches below ground surface (SB-8B). Kepone was detected in 12 of the 34 samples with concentrations ranging from 5.52 :g/kg to 260,000 :g/kg. The highest concentration of kepone was detected in sample SB-16A located in the Former Drum Staging Area. See Figure 8 for the locations and sampling results for Phase I and II surface soil samples. Table 5 provides a summary of all specific compounds detected in deep soils at the Site.

5.2.4 Freshwater Drainage Ditch

The Freshwater Drainage Ditch (FWDD) consists of two distinct sections: Section A and Section B. Section A includes the portion of the FWDD from the flow control valve on Ruetgers-Nease property, upstream to the surface water discharge points. Section B includes the portion of the FWDD from the flow control valve downstream to the confluence with Spring Creek.

Three surface water discharges from the Ruetgers-Nease facility comprise the upstream portion of FWDD Section A and include two surface water discharges from the facility and the treated groundwater effluent discharge. Following the confluence of these three discharges, the FWDD consists of an approximately 700 foot long and approximately 3 foot wide channel (the downstream portion), which then broadens into a sedimentation basin (approximately 15 feet wide) immediately upstream of the flow control valve.

Section B of the FWDD is a narrow channel consisting of boulders, cobbles, and bedrock outcrop. Shallow groundwater discharge may occur within Section B of the FWDD during wet periods of the year, providing intermittent flow.

5.2.4.1 FWDD Surface Water

Five unfiltered surface water samples (SW-5-1, SW-5-2, SW-6, SW-8, and SW-10) were collected from the FWDD during the two phases of the RI. Each sample was analyzed for VOCs, mirex, and kepone. Figures 9 and 10 present a summary of these analytical results.

Three of the five surface water samples were collected in Section A of the FWDD and had concentrations of total VOCs ranging from not detected (ND) to 4,533 micrograms per liter (:g/l). Mirex concentrations from unfiltered samples in this section of the FWDD ranged from 0.0452 :g/l to 0.483 :g/l. Kepone concentrations in unfiltered samples ranged from ND to 0.0614 :g/l. The upper forked portion of Section A contained the highest concentrations of VOCs.

The two surface water samples collected from Section B of the FWDD had total VOC concentrations ranging from ND to 4 :g/l. Mirex concentrations from the unfiltered samples in Section B ranged from ND at the furthermost downstream location to 0.096 :g/l. Kepone was not detected in either sample.

5.2.4.2 FWDD Sediment

Ten sediment samples were collected from eight FWDD locations. Each sample was analyzed for VOCs, mirex, and kepone, except for three samples which were analyzed for mirex and kepone only.

Seven of the ten sediment samples were collected in Section A of the FWDD. VOC concentrations ranged from an estimated concentration of 13 micrograms per kilogram (:g/kg) to 44,510 :g/kg. Mirex ranged from an estimated concentration of 5.9 :g/kg to 6,240 :g/kg. Kepone concentrations ranged from not detected (ND) to an estimated concentration of 118 :g/kg. In general, the uppermost forked portion of Section A exhibited the greatest concentrations of VOCs, mirex, and kepone.

Three of the ten sediment samples were collected in Section B of the FWDD. VOCs were not detected in any of the samples. Mirex ranged from an estimated concentration of 61.7 :g/kg to 224 :g/kg. Kepone concentrations ranged from ND to an estimated value of 8 :g/kg.

5.2.5 Spring Creek

Spring Creek surface water and sediments were sampled at three locations (SW/SED-1, SW/SED-2, and SW/SED-3). Fish tissue samples from species representing upper and lower trophic levels were collected from these same locations. Figure 9 depicts the approximate locations and results of the surface water and sediment sampling effort for Spring Creek.

5.2.5.1 Spring Creek Surface Water

Three surface water samples were collected from Spring Creek; one sampling location was in the vicinity of the Benner Spring Fish Hatchery (SW1), another in the vicinity of Houserville Park (SW2) and the last sampling location (SW3) was upstream of Thornton Spring, Highway 26, and the FWDD.

VOCs were not detected in either the upstream sample or the furthest downstream sample. The sample in the vicinity of Houserville Park had a total VOC concentration of 4 :g/l. Neither mirex nor kepone were detected in the surface water samples.

5.2.5.2 Spring Creek Sediment

Three sediment samples were collected from Spring Creek during the RI at the same times and locations as the surface water samples. All three samples were analyzed for VOCs, mirex, and kepone.

VOCs were not detected in the upstream sample and in the sample collected in the vicinity of Houserville Park. The sample collected in the vicinity of the Benner Spring Fish Hatchery had an estimated total VOC concentration of 117 micrograms per kilogram (:g/kg). Mirex was detected in the downstream samples at concentrations of 36.9 :g/kg and 42.4 :g/kg. Mirex was not detected in the upstream sample. Kepone was detected in the downstream samples at concentrations of 48.1 :g/kg and 18.4 :g/kg. Kepone was not detected in the upstream sample.

Four additional sediment samples were collected during the Sediment Toxicity Testing Program in 1992. The four sampling locations were; upstream of Thornton Spring (SC-BACKGROUND), immediately downstream of Thornton Spring (SC-TS), in the vicinity of Houserville Park (SC-PARK), and in the vicinity of the Benner Spring Fish Hatchery (SC-BENNER). See Figure 9 for approximate locations and sampling results.

The composite totals for estimated VOC concentrations for the four samples ranged from 3 :g/kg to 27 :g/kg. Mirex was not detected in the upstream sample and the sample immediately downstream of Thornton Spring. Mirex was detected at a concentration of 72.4 :g/kg in the vicinity of Houserville Park and 26.9 :g/kg in the vicinity of the Benner Spring Fish Hatchery. No kepone was detected in any of the sediment samples.

5.2.5.3 Spring Creek Fish

During Phase I of the RI, three Spring Creek fish tissue samples were collected at the same locations as the surface water and sediment locations. Fish tissue samples were collected from upper trophic level (brown trout) and lower trophic level (slimy sculpins) and analyzed for mirex and kepone. Figure 11 provides an approximate location of where the fish tissue samples were collected and their sampling results.

Mirex was detected in all the upper trophic level fish tissues at the three sampling locations. Concentrations ranged from 15.5 :g/kg (upstream sample location) to 170 :g/kg (downstream at Houserville Park). Kepone was not detected in the upper trophic level tissues.

Mirex was detected in all the lower trophic level fish at the three sample locations. Concentrations ranged from 110 :g/kg (upstream sample location) to 330 :g/kg (downstream at Houserville Park). Kepone was detected in the lower trophic levels at the three sampling locations. The concentrations of kepone ranged from 330 :g/kg (upstream sample location) to 550 :g/kg (downstream at Houserville Park).

Concentrations of mirex and kepone in fish tissues from Spring Creek have been measured since 1976 in various historical studies conducted prior to the RI. Fish downstream of the Route 26 bridge have exhibited levels of kepone and mirex in excess of FDA advisory limits for edible portions (fillets). Fish tissue levels have decreased over the years, however, mirex and kepone levels still exceed the FDA advisory limit of 100 :g/kg and 300 :g/kg, respectively.

5.2.5.4 Spring Creek Benthic Macroinvertebrate Organisms

As stated in Section 5.2.5.2, four additional sediment samples were collected during the Sediment Toxicity Testing Program in 1992. These samples were used for a 14-day solid phase toxicity testing on two organisms: the midge Chironomus tentans and the amphipod Hyalella azteca. The sediment samples were not toxic to H. azteca amphipods in the 14-day sediment toxicity tests, based on the survivability data in 14-day sediment toxicity tests with the Spring Creek sediments. The sediment sample testing also did not result in any significant mortality to C. tentans midges, based on the survivability results. There were statistically significant differences in growth for C. tentans in some of the treatment levels for the sediment samples compared to the growth of the midges in the reference sediments. Given the current state of knowledge regarding sediment bioassays, the ecological significance of this is uncertain.

6.0 SUMMARY OF SITE RISKS

A baseline Risk Assessment was prepared in order to identify and define possible existing and future health risks and potential environmental impacts associated with exposure to the chemicals present in the various environmental media at the Site if no action were taken. The baseline Risk Assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action. The baseline Risk Assessment can be found in the Remedial Investigation Report (Appendix K).

6.1 Contaminants of Concern

A total of twenty-nine (29) chemicals, including VOCs, mirex, and kepone were detected in the environmental media sampled during Phase I and II of the Remedial Investigation. Although many of the detected substances were found not to contribute significantly to overall public health, the risk assessment considered risks from all detected chemicals (i.e. all chemicals were considered of potential concern). A summary of all chemicals of potential concern are presented in Table 6.

6.2 Human Health Risk Assessment

6.2.1 Exposure Assessment

The objectives of the exposure assessment is to estimate the amount of each chemical of potential concern at a site that is actually taken into the body (i.e. the intake level or dose). The primary components of the exposure assessment include a characterization of the exposure setting, a pathway analysis, identification of possible exposure conditions, and an estimation of exposure. The results of the exposure assessment are combined with chemical-specific toxicity information to characterize potential risks.

6.2.1.1 Exposure Setting

Potential exposures under both current and future land uses of the study area were evaluated in the Baseline Risk Assessment. The following populations have been identified as having the potential to be exposed to chemicals of potential concern originating from the Site under both the current and future exposure scenarios:

! Offsite residents within the Study Area (i.e., Thornton Spring and Spring Creek);
! Onsite workers (both episodic and daily workers);
! Trespassers to the Site; and,
! Recreational visitors, who are assumed to engage in activities in and along Spring Creek.

In addition to the above populations, an analysis of the future onsite residential use of the Site was considered for the Risk Assessment.

6.2.1.2 Exposure Pathways

A complete exposure pathway consists of the following elements: (1) a chemical source or a mechanism for contaminants to be released into the environment; (2) a medium through which contaminants may be transported, such as water, soil, or air; (3) a point of actual or potential contact with contaminants (exposure point); and (4) a route or mechanism of exposure, such as ingestion, inhalation, or dermal contact at the exposure point. Both current exposure pathways and potential future exposure pathways were evaluated in the Risk Assessment. As noted in Section 5.2, above, the nature and extent of contamination at the Site was characterized by sampling surface soils, subsurface soils, sediments, surface water, groundwater monitoring wells, ambient air, and fish tissue.

The following potential exposure pathways were evaluated in the Risk Assessment:

- Use of groundwater as a drinking water source by an offsite resident under a hypothetical future land use of the Study Area. Potential exposure is assumed to be via ingestion of groundwater, dermal contact with groundwater, and inhalation of vapors from groundwater during showering. Potential exposure of children was considered for ingestion of groundwater and soil.

- Direct contact with surface soil and groundwater by an onsite resident under a hypothetical future land use of the Site. Potential exposure is assumed to be via ingestion of groundwater and soil, dermal contact with groundwater and soil, and inhalation of vapors from groundwater during showering. Potential exposure of children was considered for ingestion of groundwater and soil.

- Direct contact with offsite surface water and sediment during activities such as fishing and wading. During these activities, potential exposure would be via incidental ingestion of and dermal contact with surface water and sediment. Populations potentially exposed via these pathways are assumed to be recreational visitors and residents (at Thornton Spring). These pathways are assumed for both the current and future land use scenarios.

- Direct contact with surface soil by offsite (floodplain) residents along Spring Creek. Surface soil concentrations along Spring Creek were assumed to be the same as sediment concentrations found at Thornton Spring. Potential exposure of children was considered for incidental ingestion of soil.

- Direct contact with subsurface soil by onsite workers during episodic construction/excavation activities. Potential exposure is assumed to be via incidental ingestion of and dermal contact with deep onsite soils. These pathways could occur under both current and future land use scenarios.

- Direct contact with surface soils by daily onsite (maintenance) workers as part of their regular activities. Potential exposure is assumed to be via incidental ingestion and dermal contact with surface soils onsite.

- Direct contact with surface soil, surface water, and sediment by a trespasser at unfenced portions of the Site (spray field area). Potential exposure is assumed to be via incidental ingestion of and dermal contact with soil, surface water, and sediment. These pathways were assumed for both the current and future land use scenarios.

- Inhalation of airborne chemicals volatilizing from Thornton Spring by offsite residents. This pathway was assumed for both the current and future land use scenarios.

- Ingestion of fish caught in Spring Creek. A fish advisory imposed by the Pennsylvania Fish and Game Commission, limiting local fishing to catch-and-release only, has been in effect within the Study Area since 1982. The future use scenario assumes that the fishing advisory is no longer in place and concentrations in fish remain at the current levels.

- Ingestion of beef that may have been raised in the vicinity of Spring Creek near Houserville Park.

Table 7 summarizes the pathways of exposure that exist for the current and future uses within the Site and Study Area.

6.2.1.3 Exposure Scenarios

The exposure assessment identified potential exposure pathways. Six populations were identified as having the potential to be exposed to chemicals originating from the Site under both current and future land use exposure scenarios.

For current exposure scenarios, the following populations and pathways were identified:

- Offsite residents, assumed to be exposed to chemicals in surface water and sediment from Thornton Spring and to airborne vapors emanating from the spring;

- Offsite residents in the floodplain area, assumed to be exposed to sediments from Spring Creek and to ingestion of locally-raised beef;

- Onsite episodic worker, assumed to be exposed to chemicals in subsurface soil during construction or excavation activities;

- Onsite daily worker, assumed to be exposed to surface soils as part of maintenance activities conducted at the Site;

- Trespassers, assumed to be exposed to chemicals in surface soil on the unfenced spray irrigation area of the Site and to chemicals in surface water and sediment in the freshwater drainage ditch; and

- Recreational visitors, assumed to be exposed to chemicals in surface water and sediment from Spring Creek.

Under the future land use scenario, all of the above exposure populations and pathways were assessed. In addition, the following populations and pathways were considered:

- Offsite resident, assumed to be exposed to groundwater used as a domestic water supply (via ingestion, dermal contact, and inhalation of vapors during showering); and

- Recreational visitors, assumed to consume fish caught in Spring Creek.

- Onsite resident, assumed to be exposed to groundwater used as a domestic water supply (via ingestion, dermal contact and inhalation of vapors during showering) and surface soils (via incidental ingestion).

In accordance with USEPA Superfund guidance, the risks for the above pathways were assessed for the reasonable maximum exposure (RME) scenario, defined as the highest exposure that is reasonably expected to occur. Exposure factors used to calculate risks for the RME were generally based on default values recommended by USEPA that are a combination of upper-bound and average values.

6.2.2 Toxicity Assessment

For all but two of the chemicals of potential concern, toxicological values--reference doses (RfDs) for non-carcinogenic chemicals and the non-carcinogenic effects of carcinogens, and cancer slope factors (SFs) for known, suspected, and possible human carcinogens--derived by USEPA were used in the risk assessment.

Independent evaluations of the toxicological potential of mirex and kepone have been performed by the Weinberg Consulting Group. Toxicological data for mirex were reviewed and an RfD of 2 x 10 4 has been accepted by USEPA for this chemical. Weinberg has submitted a petition to the IRIS Information Submission Desk requesting that the USEPA reconsider its cancer slope factor for mirex. Weinberg concluded that the available data on the potential carcinogenicity of mirex would result in calculation of a cancer slope factor of 0.34-1 (mg/kg/day). The petition is still under review by USEPA, but a preliminary evaluation of USEPA concluded that an interim cancer slope factor of 0.53 (mg/kg/day)-l should be used, since the USEPA has not yet finalized the proposed adoption of a body weight scaling factor to the 3/4 power instead of to the current 2/3 power. Although the body weight scaling change will probably be made, it has not yet been formally approved. Weinberg also submitted petitions to the IRIS Information Submittal Desk on the oral RfD and cancer slope factor for kepone. USEPA Region III toxicologists have reviewed the Weinberg petitions and have recommended that the Weinberg conclusions be used to calculate human risks in this RI report. While a chronic oral RfD for kepone of 6.5 x 10-4 mg/kg-day was derived, none of the three published studies that address the carcinogenic potential of kepone provide adequate data for quantitative cancer risk assessment and determination of a slope factor. Therefore, kepone was not evaluated for carcinogenic potential in the risk assessment.

6.2.3 Risk Characterization

The baseline risk assessment in the RI/FS quantified the potential carcinogenic and non-carcinogenic risks to human health posed by contaminants in several exposure media. The carcinogenic and non-carcinogenic risks were determined for groundwater, surface water, sediment, soil, air, and food (beef and fish).

Carcinogenic risk is presented as the incremental probability of an individual contracting some form of cancer over a lifetime as a result of exposure to the carcinogen. For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 1.0 x 10-4 (or 1 in 10,000), and 1.0 x 10-6 (or 1 in 1,000,000) using information on the relationship between dose and response. Risk standards for non-carcinogenic compounds are established at acceptable levels and criteria considered protective of human populations from the possible adverse effects from exposure. The ratio of the average daily doses ("ADD") to the reference dose ("RfD") values, defined as the Hazard Quotient, provides an indication of the potential for systemic toxicity to occur. To assess the overall potential for a non-carcinogenic effects posed by multiple chemicals, a Hazard Index ("HI") is derived by adding the individual hazard quotients for each chemical of concern. This approach assumes additivity of critical effects of multiple chemicals. EPA considers any HI exceeding one (1.0) to be an unacceptable risk to human health. The current risks and future risks for each of the exposed populations are summarized in Table 8.

6.2.3.1 Current Use Scenario

The excess lifetime cancer risk for offsite residents currently exposed to contaminants in Thornton Spring is 2 x 10-6 (or 2 in 1,000,000). The noncarcinogenic hazard index is 0.07. The exposure pathways assume ingestion of surface water and sediments, dermal contact with surface water, and inhalation of vapors.

For the offsite resident who currently lives along or near to Spring Creek, the excess lifetime cancer risk is 1 x 10-6 (or 1 in 1,000,000). The HI is 0.06. The exposure pathways assumed are ingestion of Spring Creek sediments and the indirect pathway of ingestion of locally-grown beef.

For the onsite episodic worker, the excess lifetime cancer risk is 5 x 10-7 (or 5 in 10,000,000). The HI is 0.4. The exposure pathways assume ingestion of subsurface soils.

The excess lifetime cancer risk for an onsite daily worker is estimated at 1 x 10-6 (or 1 in 1,000,000). The non-carcinogenic hazard index is 0.04. A daily worker is assumed to be onsite 250 days per year over a 25-year career. The exposure pathway would be only via exposed surface soils since buildings and paved areas constitute a majority of the manufacturing portion of the facility.

For the trespassing scenario, the excess lifetime cancer risk is 9 x 10-8. The HI is 0.02. The exposure pathways assume ingestion of surface water and sediment from the drainage ditch area and soils from the spray field, and dermal contact with surface water.

The excess lifetime cancer risk for the recreational visitor of Spring Creek is estimated at 7 x 10-8. The non-carcinogenic hazard index is 0.0003. The exposure pathways assume ingestion of sediment and surface water, and dermal contact with sediments of Spring Creek. This scenario assumes that local fisherman return all fish caught in Spring Creek.

6.2.3.2 Future Use Scenario

The excess lifetime cancer risk for a future offsite resident, who would utilize groundwater in the area as a potable water supply is 2 x 10-3 (or 2 in 1,000). The non-carcinogenic hazard index is 5. The exposure pathways for this risk include ingestion of groundwater, surface water, and sediments, dermal contact with groundwater and surface water, and inhalation of vapors.

The excess lifetime cancer risk for a future recreational visitor is 4 x 10-5 (or 4 in 100,000). The HI is 1. The recreational visitor is assumed to regularly visit Spring Creek for fishing, wading, and other water contact activities. This scenario assumes that the fishing advisory is no longer in effect and that individuals regularly consume fish from Spring Creek.

For the future onsite resident, the excess lifetime cancer risk is 1 x 10-2 (or 1 in 100). The non-carcinogenic hazard index is 1,100. The exposure pathways for this risk include ingestion and dermal contact of groundwater and soils, and inhalation of vapors.

The risk from potential future use of Site groundwater is unacceptable. In addition, risk from onsite soils is demonstrated. Therefore, remediation of the groundwater, Thornton Spring surface water, and soils are warranted.

6.3 Environmental Risk Assessment

Potential risks to ecological resources (aquatic and terrestrial populations) from chemical substances associated with the Site were evaluated in the Environmental Risk Assessment (ERA) which was included in the Remedial Investigation (RI) Report. The Site, as defined in the assessment, includes the Ruetgers- Nease property plus the offsite drainage areas into which the chemicals of interest may have migrated. Previously collected data on the condition of benthic macroinvertebrates and fish in Thornton Spring and Spring Creek were considered in the assessment, along with a screening-level analysis of exposure and risk to receptor species based on the results of the RI chemical analyses of surface water, sediments, soil, and fish tissues. Field observations describing habitats and fish and wildlife sightings in the area were also factored into the assessment.

Based on the RI characterization analytical data, past operations at the chemical facility, the environmental fate characteristics, and available ecotoxicological effects data for specific chemical substances, the assessment focused primarily on mirex and kepone; however, the volatile organic compounds (VOCs) are factored in as part of the aquatic toxicity tests conducted for the site.

Sampling, chemical analysis, and the evaluation of exposure and potential risk was conducted for six distinctive zones or "Risk Management Units" (RMUs) within the site area. The RMUs are:

- RMU1 - The approximately 15-acre grassy field (former spray field area) to the southwest of the developed (fenced in) portion of the Ruetgers-Nease property;

- RMU2 - The drainage ditch from the point at which the Ruetgers-Nease groundwater treatment facility effluent is discharged, downstream to the confluence of the ditch with Spring Creek (a distance of approximately 2,000 feet). For the risk characterization, RMU2 is further divided into the drainage ditch on Ruetgers-Nease property (RMU2A) and the drainage ditch beyond the property to the point where it enters Spring Creek (RMU2B);

- RMU3 - Thornton Spring from the point at which it emerges from the ground to its confluence with Spring Creek (a distance of approximately 200 feet);

- RMU4 - Spring Creek and its riparian zone in the vicinity of Pike Street bridge in Lemont (upstream from both the drainage ditch and Thornton Spring confluences);

- RMU5 - Spring Creek and its riparian zone in the vicinity of Houserville Park (downstream of both the drainage ditch and Thornton Spring confluences);

- RMU6 - Spring Creek and its riparian zone in the vicinity of the Pennsylvania Fish Commission Research Station and Hatchery at Benner Spring (further downstream from RMU5).

These RMUs were selected for sampling and analysis based upon their geographic locations relative to potential surface and subsurface sources of chemicals associated with the Ruetgers-Nease facility. All RMUs, except RMU4, are in the potential migration pathway for chemicals originating from the facility. RMU4 is upstream from the sources and therefore it serves as a "background area" for Spring Creek.

Exposures were based on measured levels where such data were available (i.e., soil, surface water, sediments and fish tissue) and on estimated levels using generally accepted models of uptake and bioaccumulation for foodchain transfer. The following indicator receptors were carried through the assessment, although their inclusion varies by RMU: fish and aquatic invertebrates, piscivorous birds and mammals, insectivorous birds, and terrestrial predators. Toxicity thresholds were identified or derived for relevant biota based either on existing or recommended guidelines (i.e., ambient water quality criteria or sediment thresholds). Where published guidance was not available, toxicity thresholds were derived. The quotient method for characterizing potential risk was used for both mirex and kepone in this assessment. The ratio of measured or estimated exposure to the established or estimated toxicity threshold gives an indication of relative risk, assuming that the receptors inhabit the area and are continuously exposed to the chemical of concern. In this assessment, ratios of greater than one were interpreted to indicate ecological risk, while ratios of less than one indicate no or negligible ecological risk.

The ERA carried out in the RI, however, used the surrogate approach, which involves extensive assumptions as the basis for the models. Many of the assumptions are unjustified, resulting in an ERA that is not protective of ecological receptors as a whole. For example, the ERA used the assumption that the organic carbon level of the soil is 5% and the lipid content of the earthworm is 0.85%. The carbon content of the Site soil ranges from 1% to 4% (Ref. SCS) and the lipid content of the earthworms is 1.5% (Lawrence and Millar, 1945). Using the reasonable assumption that the average carbon content of the soil is 2.5% and entering the values of 2.5 and 1.5 into the calculations to derive the bioaccumulation factor for earthworms, the results increase nearly four-fold.

$$BAF = \frac{\%\ lipid\ (Kow)}{\%\ carbon\ (Koc)}$$

These changes exert a change in the environmental effects quotient from the 0.05 contained in the RI to 9.5.

The results of the quotient method analysis, indicates exceedances of one (ratio of exposure estimate to chronic toxicity threshold estimate) for all RMUs, except RMU1 and RMU4. However, assumptions used in the modelled surrogate found in the RI are linked to literature sources, but are actually postulated toxicological estimates. They fall into the category of estimates by virtue of the fact that they are not linked by specific data to the Site. Since the ERA is not directly linked to the Site, no justification exists for any approach other than the conservative quotient approach.

This approach takes the 95% upper confidence level and calculates quotients from the simple division of appropriate chronic criteria levels for all contaminants reported in all media. In this way, the results are conservative and protective of ecological receptors as a whole.

Using this approach, ecological risk is demonstrated for all media examined. The potential for ecological risk is very likely demonstrable in areas not included in the Remedial Investigation and ERA (e.g., the flood plain areas of Spring Creek and downstream beyond the area of RMU6).

6.4 Conclusion

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

7.0 REMEDIAL OBJECTIVES

Remedial objectives for the Site have been developed for each media based on the results of the Baseline Risk Assessment and the Environmental Risk Assessment, evaluation of chemical-specific ARARs, the Summers Model results (for natural conditions), and EPA's initial remedial objectives developed early in the Feasibility Study process. The final Remedial Action Objectives and their values are discussed below for each medium.

7.1 Remedial Objectives for Groundwater and Thornton Spring Surface Water

The Risk Assessment indicates that the carcinogenic and non-carcinogenic risks associated with exposure to contaminated groundwater at the Site exceed acceptable levels and therefore warrant remedial action to clean up groundwater at the Site. MCLs and MCLGs are currently exceeded within the area of attainment.

The following remedial objectives were developed for the groundwater at the Site and Thornton Spring surface water based upon the considerations outlined above:

- Remediate contaminants of concern onsite and mitigate offsite migration of contaminants of concern in groundwater;
- Restore groundwater quality within the attainment area; and,
- Reduce contaminants of concern in Thornton Spring surface water to comply with ARARs.

7.2 Remedial Objectives for Onsite Soil

The Risk Assessment indicates that the non-carcinogenic risks associated with exposure to soils at the Site exceed acceptable levels. In addition, the Environmental Risk Assessment determined that there are potential risks to terrestrial environmental receptors at the Site. The Summers Model results indicated that there are impacts to groundwater associated with the subsurface soil, which are primarily a result of potential leaching of VOCs to groundwater.

The following remedial objectives were developed for the onsite soils at the Site based on the considerations outlined above:

- Mitigate leaching of contaminants of concern from subsurface soil so as to be protective of groundwater; and,
- Protect environmental receptors.

7.3 Remedial Objectives for Freshwater Drainage Ditch Surface Water

The Risk Assessment determined that there are no unacceptable risks to human health associated with exposures to freshwater drainage ditch surface water. However, the Environmental Risk Assessment determined that the risk quotients exceeded toxicity thresholds for surface water dwelling organisms in the freshwater drainage ditch. The Pennsylvania surface water quality standards were exceeded for several contaminants of concern.

The following remedial objective was developed for the freshwater drainage ditch surface water based on the considerations outlined above:

- Control the quality of the water entering the freshwater drainage ditch to acceptable levels based on environmental risks and ARARs.

7.4 Remedial Objectives for Freshwater Drainage Ditch Sediments

The Risk Assessment determined that there are no unacceptable risks to human health associated with exposures to freshwater drainage ditch sediments. However, the Environmental Risk Assessment determined that sediment quality in the freshwater drainage ditch exceeded toxicity thresholds for sediment dwelling organisms.

As was the case for onsite subsurface soils, the leaching of contaminants of concern from sediments in the freshwater drainage ditch can impact groundwater quality. In addition, the freshwater drainage ditch is a conduit for contaminated runoff draining from the Site to Spring Creek.

The following remedial objectives were developed for the freshwater drainage ditch sediments at the Site based on the considerations outlined above:

- Mitigate leaching of contaminants of concern from subsurface soil so as to be protective of groundwater; and,
- Protect environmental receptors.

7.5 Remedial Objectives for Spring Creek Surface Water

The Risk Assessment determined that there are no unacceptable risks to human health associated with exposures to Spring Creek surface water. Mirex and kepone were not detected in surface water indicating negligible to no environmental risks. The Pennsylvania surface water quality standards were exceeded for one contaminant of concern.

Considering the above, the following remedial objective was developed for Spring Creek surface water:

- Control the contaminants of concern entering Spring Creek (Thornton Spring surface water and, groundwater discharges from the Site) to acceptable levels based on ARARs.

7.6 Remedial Objectives for Spring Creek Sediments

The Risk Assessment determined that there are no unacceptable carcinogenic risks to human health associated with exposures to Spring Creek sediments or from ingestion of fish. However, there are non-carcinogenic risks from the ingestion of fish. Based on the Environmental Risk Assessment, environmental risk is demonstrated to biota that inhabit Spring Creek (both aquatic and terrestrial species).

Considering the above, the following remedial objective was developed for Spring Creek sediments:

- To reduce the bioavailability of mirex and kepone detected in Spring Creek sediments such that fish tissue levels of mirex and kepone do not exceed FDA action levels. FDA has established action levels for fish tissue levels of mirex and kepone which are set at 100 :g/kg and 300 :g/kg, respectively.

8.0 DESCRIPTION OF ALTERNATIVES

The Feasibility Study (FS) prepared by Golder Associates (June 1994) evaluated two to four alternatives for each of the five media/locations to address risks posed by current and potential future exposure to contaminants at the Centre County Kepone Site. Applicable remediation technologies were initially screened in the FS based on effectiveness, implementability, and cost. The alternatives meeting these criteria were then evaluated and compared to nine criteria required by the National Contingency Plan ("NCP"). The NCP requires that "No Action" alternatives be evaluated as a point of comparison for other alternatives. The alternatives evaluated for groundwater/Thornton Spring surface water, soils, drainage ditch surface water, drainage ditch sediments, and Spring Creek sediments are described below.

The applicable or relevant and appropriate requirements (ARARs)for each alternative are not included in this section. A discussion of all ARARs for the selected remedy is contained in Section 11.2.

8.1 Groundwater and Thornton Spring Surface Water GW/TS-1 No Action

Estimated Capital Costs: $0
Estimated Annual O&M Costs: $88,500
Estimated Present-Worth Costs: $1,100,000
Estimated Implementation Time: Immediate

The NCP requires that EPA consider a "No Action" alternative for every site to establish a baseline for comparison to alternatives that do require action. Under this alternative, the current groundwater extraction and treatment system would be terminated. This alternative provides only for routine groundwater and surface water sampling to monitor changes in water quality at the Site and Thornton Spring.

GW/TS-2 Limited Action

Estimated Capital Costs: $30,000
Estimated Annual O&M Costs: $547,000
Estimated Present-Worth Costs: $6,814,000
Estimated Implementation Time: Immediate

This alternative includes continued monitoring and operation of the existing groundwater extraction and treatment system and institutional controls for Thornton Spring. The groundwater would continue to be pumped to the filter bag unit for solids removal and then to a decanter for free product separation. The groundwater will flow through the existing packed bed, counter-current air stripper to an equalization tank prior to introduction into granular activated carbon (GAC) adsorbers. Treated groundwater would continue to be discharged to the facility's surface water system in accordance with the existing National Pollutant Discharge Elimination System (NPDES) discharge permit. Spent carbon will continue to be shipped offsite for regeneration. The spent filter bags will continue to be collected in 55-gallon drums and characterized for proper disposal. Sampling of groundwater from monitoring wells and Thornton Spring surface water is included. Fencing will be constructed around the Thornton Spring area. Institutional controls such as deed restrictions will be implemented at Thornton Spring.

GW/TS-3 Groundwater Source and Migration Control

Estimated Capital Costs: $2,700,000
Estimated Annual O&M Costs: $491,000
Estimated Present-Worth Costs: $9,052,000
Estimated Implementation Time: 30 years

This alternative would include a new or supplemental groundwater source control system and a migration control system. The cost estimates for this alternative are based upon utilizing ten (10) source control wells (seven new) in the plant production area and eighteen (18) migration control wells (twelve new) located near the downgradient property boundary. However, the actual number and location of source and migration control wells will be determined following additional hydrogeologic characterization that will be conducted during the remedial design phase.

The anticipated flow rate for the groundwater extraction system will be approximately equal to the average annual discharge rate at Thornton Spring, approximately 240 gallons per minute. Groundwater pumped from the extraction systems will be treated in an upgraded onsite treatment system; the existing air stripper and GAC system would be upgraded and sized for higher flow rates. A free product phase separation system will be installed for recovery in the equalization tank. The treatment system will be designed to reduce or remove Site-related VOCs in the extracted groundwater, unattended, on a continuous 24 hour per day performance basis. The ultimate objective of this alternative is to restore the contaminated groundwater and surface water to background levels, if technically practicable. The effluent would be discharged to the facility's surface water system, consistent with NPDES permit requirements. Spent carbon will be shipped offsite for regeneration. The spent filter bags will be collected in 55-gallon drums and will be characterized for proper disposal. Periodic monitoring of the influent and the effluent is included to evaluate the effectiveness of the treatment system. In addition, the surface water from Thornton Spring will be monitored prior to initiating operation of the groundwater extraction system. The purpose of the monitoring is to establish the baseline contaminant concentrations at Thornton Spring and evaluate the performance of the groundwater extraction system during operation. This alternative also includes sampling of groundwater from monitoring wells and Thornton Spring surface water.

The final design of this alternative will undergo an analysis to determine the projected thermal effects to Spring Creek. If necessary, mitigation plans will be included as part of the remedial design to maintain the existing thermal regime of Spring Creek.

Institutional controls such as deed restrictions will be implemented for Thornton Spring, as well as maintaining the current zoning for the Site as industrial use. Fencing will be constructed around the Thornton Spring area. For costing purposes, the remediation time for groundwater source and migration control was based on 30 years (the maximum period of performance used by EPA for costing purposes).

GW/TS-4 Groundwater Source Control and Thornton Spring Surface Water In-situ Treatment

Estimated Capital Costs: $4,340,000
Estimated Annual O&M Costs: $832,000
Estimated Present-Worth Costs: $14,926,000
Estimated Implementation Time: 30 Years

This alternative retains the groundwater source control wells presented in Alternative GW/TS-3. However, an in-situ treatment system for Thornton Spring surface water would be utilized instead of a system of onsite migration control wells. An in-situ GAC bed would be installed at Thornton Spring to remove organic constituents from the surface water. The cost estimates for this alternative are based on utilizing ten (10) source control wells (seven new) in the plant production area, in-situ GAC treatment for Thornton Spring surface water, a clear well at Thornton Spring to equalize flow to the GAC treatment system, and upgrade of the existing onsite treatment system as described in alternative GW/TS-3. However, the actual number and location of source control wells will be determined following additional hydrogeologic characterization that will be conducted during the remedial design phase.

The anticipated flow rate for the groundwater extraction wells is approximately 20 gpm to 40 gpm. The treatment plant at Thornton Spring must be capable of treating an average of 250 gpm and up to 3,000 gpm. Both treatment systems will be designed to reduce or remove the Site-related VOCs in the extracted groundwater and surface water, unattended, on a continuous, 24 hour per day performance basis. The ultimate objective of this alternative is to restore the contaminated groundwater and surface water to background levels, if technically practicable. The effluent from the extraction wells would be discharged to the facility's surface water system, consistent with NPDES permit requirements. Treated spring water would be released to the surface flow system. Spent carbon will be shipped offsite for regeneration. The spent filter bags will be collected in 55-gallon drums and will be characterized for proper disposal. Periodic monitoring of the influent and the effluent is included to evaluate the effectiveness of the treatment system. This alternative also includes sampling of groundwater from monitoring wells and Thornton Spring surface water.

The final design of this alternative will undergo an analysis to determine the projected thermal effects to Spring Creek. If necessary, mitigation plans will be included as part of the remedial design to maintain the existing thermal regime of Spring Creek.

Institutional controls such as deed restrictions will be implemented for Thornton Spring, as well as maintaining the current zoning for the Site as industrial use. Fencing will be constructed around the Thornton Spring area. For costing purposes, the remediation time for groundwater source control and Thornton Spring surface water in-situ treatment was based on 30 years (the maximum period of performance used by EPA for costing purposes).

8.2 Subsurface Soils

SS-1 No Further Action

Estimated Capital Costs: $0
Estimated Annual O&M Costs: $0
Estimated Present-Worth Costs: $0
Estimated Implementation Time: Immediate

Interim soil remediation was performed at the Site prior to performance of the RI. Under this alternative, no additional soil remediation will be performed.

SS-2 Excavation/Offsite Disposal

Estimated Capital Costs: $4,224,000
Estimated Annual O&M Costs: $1,500
Estimated Present-Worth Costs: $4,243,000
Estimated Implementation Time: 1 Year

Under this alternative, contaminated soils from the more isolated and unobstructed areas on the Ruetgers-Nease property would be excavated where the concentrations of VOCs in soil exceed levels that are protective of groundwater (see Table 9). These areas include, but are not limited to, the Former Drum Staging Area, the Designated Outdoor Storage Area, and the Tank Farm/Building #1 Area (see Figure 12). Soils would be sampled and analyzed for waste characterization prior to disposal at an offsite RCRA permitted subtitle C hazardous waste landfill. If required, thermal treatment of the excavated soil would be used to meet RCRA land disposal regulations contained in 40 C.F.R. Part 268. For cost estimating purposes, it was estimated that 6,000 cubic yards of soil would be excavated and RCRA land disposal restrictions would not apply.

Following removal of the contaminated soils, all areas would be backfilled with structural soil. The final six inches of fill will be topsoil and the areas will be vegetated to prevent erosion. Site regrading, with modifications to the surface drainage system, may be performed under this alternative.

Institutional controls such as deed restrictions will be implemented for the property, as well as maintaining the current zoning for the Site as industrial use. Fencing will be extended around the Site to include the former spray field and former drum staging area.

SS-3 Soil Vapor Extraction

Estimated Capital Costs: $1,086,000
Estimated Annual O&M Costs: $151,000
Estimated Present-Worth Costs: $2,477,000
Estimated Implementation Time: 15 Years

The soil vapor extraction (SVE) alternative will be designed to remove Site-related contaminants from the unsaturated zone soils where they exceed levels that are protective of groundwater. Soil vapor extraction consists of a network of extraction wells connected to the suction side of a vacuum extraction unit. Under this alternative, two SVE systems, one in the plant production area and one in the spray field area would be constructed with independent treatment systems for each. The extracted vapors will be destroyed most likely through catalytic oxidation treatment. Because of the relatively low hydraulic conductivity of the soils in the plant area, hydrofracturing of the soil may be required to increase the effective radius of the SVE wells. A performance test may be needed during the remedial design phase to further evaluate the effectiveness of soil hydrofracturing at the Site. A pilot test may be necessary to obtain data to support the design of an SVE well system.

Institutional controls such as deed restrictions will be implemented for the property, as well as maintaining the current zoning for the Site as industrial use. Fencing will be extended around Site to include the former spray field and former drum staging area.

SS-4 Capping

Estimated Capital Costs: $1,896,000
Estimated Annual O&M Costs: $11,500
Estimated Present-Worth Costs: $2,039,000
Estimated Implementation Time: 1 Year*

This alternative would involve capping all the areas of contaminated surface and subsurface soils on the Ruetgers-Nease property to reduce infiltration and associated leaching of contaminants of concern to the groundwater. The cap would be made of structural concrete in the areas near the operating facilities and cover approximately 85,500 square feet. In more isolated areas, such as the former spray field area and former drum storage area, approximately 24,500 square feet of cap would be made of a 20-mil to 60-mil synthetic geomembrane, covered with geotextile, and then covered with approximately 2 feet of soil with vegetative cover. The areas to be capped would include the same areas depicted on Figure 12. Some surface regrading may be necessary to redirect surface water from low lying areas.

Institutional controls such as deed restrictions will be implemented for the property, as well as maintaining the current zoning for the Site as industrial use. Fencing will be extended around the Site to include the former spray field and former drum staging area.

8.3 Freshwater Drainage Ditch Surface Water

FWDD/SW-1 No Action

Estimated Capital Costs: $0
Estimated Annual O&M Costs: $48,000
Estimated Present-Worth Costs: $596,000
Estimated Implementation Time: Immediate

No remedial activities will be undertaken for the surface water in the Fresh Water Drainage Ditch (FWDD) under the No Action alternative. However, surface water discharge monitoring will continue in accordance with the NPDES permit under this alternative.

Common Components for Alternatives FWDD/SW-2A and 2B

Upgrading physical facilities for control of surface water and the utilization of the Site's hazardous materials management programs to protect surface water discharge will be common to alternatives FWDD/SW-2A and 2B. Measures will include improvements to the surface water discharge systems to reduce potential groundwater infiltration into underground piping and, eventually, discharging into the FWDD. Specifically, stormwater collected from the active tank farm secondary containment system and roof drains from production buildings will be channeled to the groundwater treatment plant for treatment prior to discharge to the FWDD. Secondary containment systems will be provided to areas around the plant such as the outdoor material substance container storage, tank storage, and tank/trailer loading/unloading areas and coating these systems with an impermeable/wear resistant material. The discharge system to the FWDD from the treatment plant and stormwater catch basins will be improved. Also included will be the use of hazardous material management practices developed at the Site to reduce the potential for releases. Site regrading may be performed to enhance this alternative. Stormwater runoff from the Ruetgers-Nease facility would continue to be discharged to the surface water system through the FWDD and monitored monthly in accordance with the NPDES permits. Quarterly sampling and analysis of the ditch discharge for VOCs and select inorganic parameters will be performed as well as biannual sampling and analysis for mirex, kepone, and photomirex.

FWDD/SW-2A Source Control Measures; Reconstruct Existing Surface Water Drainage Pipes

Estimated Capital Costs: $663,000
Estimated Annual O&M Costs: $71,500
Estimated Present-Worth Costs: $1,550,000
Estimated Implementation Time: 6 Months

Under this alternative, approximately 920 linear feet of the existing underground surface water discharge lines will be repaired or replaced to eliminate contaminants of concern from entering the surface water of the FWDD. All of the common components stated above are included.

FWDD/SW-2B Source Control Measures; Plug Existing Surface Water Drainage Pipes and Replace with Aboveground Pipes

Estimated Capital Costs: $544,000
Estimated Annual O&M Costs: $55,500
Estimated Present-Worth Costs: $1,233,000
Estimated Implementation Time: 6 Months

Under this alternative, the existing underground surface water discharge lines will be plugged and replaced with an aboveground system to eliminate contaminants of concern from entering the surface water of the FWDD. The aboveground system will be approximately 920 linear feet in total length. All common components stated above are included.

8.4 Freshwater Drainage Ditch Sediments

FWDD/SED-1 No Further Action

Estimated Capital Costs: $0
Estimated Annual O&M Costs: $0
Estimated Present-Worth Costs: $0
Estimated Implementation Time: Immediate

FWDD sediment remediation was performed at the Ruetgers-Nease facility prior to performance of the RI. Therefore, the No Further Action alternative consists of no additional FWDD sediment remediation.

FWDD/SED-2 Excavation and Soil Lined Ditch

Estimated Capital Costs: $351,000
Estimated Annual O&M Costs: $14,900
Estimated Present-Worth Costs: $536,000
Estimated Implementation Time: 6 Months

This alternative will involve excavation of approximately 500 linear feet of contaminated sediments in the upper forked portion of Section A of the FWDD to levels that are protective of groundwater and environmental receptors (see Table 9). Conventional excavation equipment (backhoe, etc.) would be used to remove the sediments to a depth of approximately 4 feet deep. The FS estimated that approximately 400 cubic yards of sediments are contaminated in the upper forked section of the FWDD. The excavated areas would be backfilled with clean fill and seeded with a vegetative cover to prevent erosion. Excavated sediments would be disposed of at an offsite RCRA permitted subtitle C hazardous waste landfill. If required, thermal treatment of the excavated soils would be used to meet applicable RCRA land disposal regulations contained in 40 C.F.R. Part 268. However, for costing purposes, it was assumed that RCRA land disposal regulations would not apply and that soil could be disposed of at a hazardous waste landfill.

FWDD/SED-3 Concrete Lined Ditch with Limited Excavation

Estimated Capital Costs: $200,000
Estimated Annual O&M Costs: $20,500
Estimated Present-Worth Costs: $454,000
Estimated Implementation Time: 6 Months

This alternative would excavate the top 6 inches to 1 foot of sediments in the upper forked portion of Section A of the FWDD (approximately 500 linear feet). The amount of excavation required (140 cubic yards) is estimated to be that which is necessary to shape and grade the ditch for concrete liner placement. The excavated sediments would be disposed of at an offsite RCRA permitted subtitle C hazardous waste landfill. If required, thermal treatment of the excavated sediments would be used to meet applicable RCRA land disposal regulations contained in 40 C.F.R. Part 268. However, for costing purposes, it was assumed that RCRA land disposal regulations would not apply and that sediments could be disposed of at a hazardous waste landfill.

8.5 Spring Creek Sediments

Common Components

Limited data was available for riparian-area soils of Spring Creek during the RI. A common component to all alternatives for Spring Creek sediments is a phased sampling program for Spring Creek riparian-area soils, including the lower portion of the FWDD, Thornton Spring outlet and drainage channel, and depositional areas beyond the Benner Fish Hatchery. The first phase would involve mapping the depositional areas and sampling the most likely places where contamination may be found. If concentrations of mirex or kepone are found in excess of a trigger level which will be established during remedial design, an intensive grid sampling and analysis effort will be required. The sampling results from both phases will be summarized and environmental risks calculated. The riparian-area soils will be addressed as part of the ROD for OU2. The precise scope of this sampling program will be determined during the remedial design phase. Therefore, cost estimates are not included in the FS.

SC-1 No Action

Estimated Capital Costs: $0
Estimated Annual O&M Costs: $0
Estimated Present-Worth Costs: $0
Estimated Implementation Time: Immediate

The NCP requires that EPA consider a "No Action" alternative for every site to establish a baseline for comparison to alternatives that do require action. Under this alternative, no remedial activities would be performed for sediments in Spring Creek. This alternative assumes that the current "catch and release" fishing advisory is not in effect for Spring Creek and source control remediation of FWDD sediments and groundwater/Thornton Spring water will not be implemented.

SC-2 Institutional Controls and Monitoring

Estimated Capital Costs: $0
Estimated Annual O&M Costs: $39,000
Estimated Present-Worth Costs: $482,000
Estimated Implementation Time: Immediate

Under this alternative, the present "catch and release" fishing advisory on Spring Creek would be temporarily maintained as an institutional control. Continued monitoring of Spring Creek fish tissue and stream channel sediments would be conducted for up to 30 years to support cancelling the advisory in the future.

No intrusive remedial activities in Spring Creek would be conducted in this alternative and therefore, adverse impacts to the Spring Creek ecological systems are avoided.

SC-3 Hydraulic/Vacuum Dredging

Estimated Capital Costs: $19,400,000
Estimated Annual O&M Costs: $48,500
Estimated Present-Worth Costs: $20,000,000
Estimated Implementation Time: 2 Years

This alternative would involve the use of a hydraulic or vacuum dredger to remove sediments with mirex and kepone concentrations in excess of 10 :g/kg from depositional areas of Spring Creek. Approximately 15,100 cubic yards of sediments would be dredged from Thornton Spring to the Benner Fish Hatchery (approximately a 5 mile stretch). Direct access through and along the floodplain and riparian zones to the Spring Creek stream channel is required for equipment operation. The hydraulic and/or vacuum dredging equipment would remove significant quantities of water along with the sediment. The removed sediments would be dewatered and subsequently transported offsite to a RCRA permitted subtitle C hazardous waste landfill for disposal. Water, removed along with the sediments, would be treated and returned to the stream. Areas where sediments are removed will be backfilled with a substrate similar to and compatible with the natural substrate in the stream. Implementation of this alternative may have a detrimental impact on the environmental quality of the area.

In addition, continued monitoring of Spring Creek fish tissue and stream channel sediments would be conducted for up to 30 years to support cancelling the advisory in the future.

SC-4 Line Stream Channel

Estimated Capital Costs: $11,416,000
Estimated Annual O&M Costs: $58,100
Estimated Present-Worth Costs: $12,136,000
Estimated Implementation Time: 2 Years

This alternative would provide containment of sediments with mirex and kepone concentrations in excess of 10 :g/kg from depositional areas of Spring Creek from Thornton Spring to the Benner Fish Hatchery (approximately 5 miles). Pervious geotextile material will be laid on top of the existing sediment depositional areas. Following the placement of the geotextile, rip-rap and/or gravel will be placed on top of the geotextile liner as ballast, erosion protection, and to provide a more ecologically compatible substrate for lower trophic organisms. The rip-rap/gravel layer would be approximately 16 inches in thickness. Large debris and boulders will have to be removed prior to placing the geotextile to avoid damage. Direct access through and along the floodplain and riparian zones to the Spring Creek stream channel is required for equipment operation. Hydraulic controls, such as flood control walls or levees would be constructed along the riparian zone, to mitigate the increased potential for scouring, erosion, and flooding of the stream banks.

In addition, continued monitoring of Spring Creek fish tissue and stream channel sediments would be conducted for up to 30 years to support cancelling the advisory in the future.

9.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial action alternatives for the groundwater/Thornton Spring surface water, soils, drainage ditch surface water, drainage ditch sediments, and Spring Creek sediments described in the previous section were evaluated using the nine evaluation criteria as described below. The resulting strengths and weaknesses of the alternatives were then weighed to identify the alternative providing the best balance among the nine criteria.

Summary of Nine Criteria

In selecting EPA's preferred alternative, EPA evaluated each proposed remedy against the nine criteria specified in the National Contingency Plan. The alternative must first satisfy the threshold criteria. The Primary Balancing criteria are used to weigh the tradeoffs or advantages and disadvantages of the alternatives. Finally, after public comment has been obtained, the modifying criteria are considered. Below is a summary of the nine criteria used to evaluate the remedial alternatives.

Threshold Criteria

! Overall protection of human health and the environment: Whether the remedy provides adequate protection and how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

! Compliance with ARARs: Whether or not a remedy will meet all applicable or relevant and appropriate requirements ("ARARs") of Federal and State environmental statutes and/or whether there are grounds for invoking a waiver.

Primary Balancing Criteria

! Lona-term effectiveness and permanence: The ability of the remedy to afford long term, effective and permanent protection to human health and the environment along with the degree of uncertainty that the alternative will prove successful.

! Reduction of toxicity, mobility, or volume through treatment: The extent to which the alternative will reduce the toxicity, mobility, or volume of the contaminants causing the site risks.

! Short-term effectiveness: The time until protection is achieved and the short term risk or impact to the community, onsite workers, and the environment that may be posed during construction and implementation of the alternative.

! Implementability: The technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement that remedy.

! Cost: Includes estimated capital, operation and maintenance, and net present worth costs.

Modifying Criteria

! State Acceptance: Whether the Commonwealth concurs with, opposes, or has no comment on the selected remedy. The Commonwealth concurs with the remedy and therefore this criteria will not be discussed further.

! Community Acceptance: Whether the public agrees with the selected remedy. A public meeting was held October 19, 1994 in State College, Pennsylvania. Comments received from the public meeting and comments received in writing during the public comment periods are referenced in the Responsiveness Summary attached to this Record of Decision. The community favors the selected remedy and therefore, this criteria will not be discussed further.

9.1 Comparative Analysis of Alternatives for Groundwater and Thornton Spring Surface Water

Overall Protection. Since GW/TS-1 (No Action) and GW/TS-2 (Limited Action) would neither eliminate nor reduce to acceptable levels the threats to human health or the environment presented by contamination at the Site, they are not protective and therefore, will not be discussed in the remainder of this analysis.

Alternatives GW/TS-3 and GW/TS-4 will comply with PADER's groundwater ARARs which require that groundwater containing hazardous substances be remediated to background quality, or MCLs, whichever is more stringent, and would protect human health because they significantly reduce the risk associated with the ingestion and inhalation of contaminated groundwater by treating the plume. However, GW/TS-3 is considered to provide greater protection since groundwater containing contaminants of concern would not migrate through the attainment area to Thornton Spring.

Compliance with ARARs. ARARs will be met by all the remedial alternatives with the exception of the No Action and the Limited Action alternative. Alternatives GW/TS-3 and GW/TS-4 will comply with the Commonwealth of Pennsylvania's standards requiring that groundwater containing hazardous substances be remediated to "background" quality as set forth in 25 PA Code § § 264.97(i), (j), and 264.100(a)(9), or MCLs, whichever are more stringent. Any surface water discharge of treated effluent will comply with the substantive requirements of the National Pollutant Discharge Elimination System ("NPDES") discharge regulations set forth in 25 PA Code § 92.31, and the Pennsylvania Water Quality Standards (25 PA Code § 93.1-93.9).

With respect to location-specific ARARs, Alternatives GW/TS-3 and GW/TS-4 would comply with the EPA's Ground Water Protection Strategy Policy for a Class I aquifer, which is a TBC standard. Alternatives GW/TS-3 and GW/TS-4 would protect current and potential sources of drinking water and waters having other beneficial uses.

Alternatives GW/TS-3 and GW/TS-4 which include groundwater and surface water remediation, would meet the performance standards as set forth in Section 10.1 of this ROD relating to groundwater remediation and treatment.

Alternatives GW/TS-3 and GW/TS-4 would meet all location and action-specific ARARs relating to activities performed as part of the remedy, including Federal and State air emission requirements and treatment, storage, and disposal requirements for any hazardous and solid wastes generated during the groundwater treatment process.

Long-term Effectiveness and Permanence. Once clean-up goals have been met, contaminant concentrations in the groundwater aquifer will be permanently reduced to acceptable levels by Alternatives GW/TS-3 and GW/TS-4. The time for implementation is estimated to be the most rapid for GW/TS-3.

Reduction of Toxicity, Mobility, or Volume through Treatment. Alternatives GW/TS-3 and GW/TS-4 include recovery and treatment of the contaminated groundwater and will therefore significantly reduce the toxicity, mobility, and volume of the contaminants of concern by removing them. GW/TS-3 will collect and treat the contaminants of concern, more effectively and at the source before migration into the attainment areas, thereby reducing the toxicity, mobility, and volume of the contaminants of concern at the Site.

Short-term effectiveness. Alternative GW/TS-4 will have larger potential exposure risks associated with the construction and operation of the in-situ treatment system at Thornton Spring. In-situ treatment, if successful, will potentially have short-term reductions in exposure risks at Thornton Spring, similar to those achieved by GW/TS-3, but it may also have contaminants of concern in the groundwater in some of the attainment area during the period of implementation. GW/TS-3 has a low potential risk of remedial worker exposure to contaminants of concern associated with the installation of the extraction well systems. The time for implementation of the remedial actions and attaining RAOs is shorter for GW/TS-3 than for GW/TS-4. Further, mitigation of contaminants of concern in the attainment area will be accomplished earlier in the implementation period.

Implementability. GW/TS-3 and GW/TS-4 use established technologies which are readily implementable. Enhancement of the migration control wells under GW/TS-3 is less common and may require a pre-design study. GW/TS-4 involves a relatively unique application which will be difficult to design and implement, especially with the large flow variations observed at Thornton Spring.

Cost. Capital and operation and maintenance costs are summarized in Table 10. The estimated present-worth costs of the selected Alternative (GW/TS-3) is estimated at $9,052,000. Alternative GW/TS-3 is less costly than Alternative GW/TS-4 and provides the same degree of risk reduction.

9.2 Comparative Analysis of Alternatives for Subsurface Soils

Overall Protection. EPA has developed cleanup levels for all contaminants of concern with the objective of removing contaminated soil that has the potential to migrate to groundwater. Alternatives SS-1 (No Further Action) and SS-4 (Capping) will neither eliminate nor reduce the soil contamination to acceptable levels, except by natural attenuation. Therefore, they will not be discussed further. Alternatives SS-2 (Excavation) and SS-3 (Soil Vapor Extraction) provides the highest level of overall protectiveness because it will result in the permanent removal of all VOC contaminants of concern for the soils at the Site. However, the use of

SVE has limited application at the Site.

Compliance with ARARs. There are no ARARs that are pertinent for the development of clean-up levels for the contaminated soil at the Site. The equations used to develop soil clean-up criteria for contaminants of concern in soil for the site require the use of an acceptable standard for groundwater. The groundwater criteria are used to back calculate the soil criteria. Section 264.97(i), (j) and 264.100(a)(9) of Title 25 of the Pennsylvania Code sets forth standards that are ARARs for groundwater. The Commonwealth of Pennsylvania maintains that this requirement to remediate to background is found in other legal sources. In addition, the Pennsylvania Department of Environmental Resources document entitled "Cleanup Standards for Contaminated Soils", dated December 1993, is a "To Be Considered" (TBC) requirement that establishes soil cleanup standards deemed to be acceptable under the residual waste regulations. The regulation and the guidance document were used in the development of the soil clean-up criteria. Alternatives SS-2 and SS-3 will meet the soil clean-up criteria.

Kepone is an origin RCRA listed waste as discarded material U142 and is addressed under RCRA in 40 C.F.R. Part 268 which describes the prohibitions on land disposal of various hazardous wastes. Since contaminants will exist in the soil excavated under Alternative SS-2, the soil will first be tested to determine if kepone concentrations are above the risk-based concentration of 160 ppb. If kepone concentrations are below 160 ppb, the soil will be tested to determine if it is a RCRA characteristic waste in accordance with 40 C.F.R. § 261.24 by the Toxic Characteristic Leaching Procedure ("TCLP"). If it is determined to be hazardous waste or kepone concentrations are above 160 ppb, the remedy will be implemented consistent with the substantive requirements, which are relevant and appropriate, of PA Code § § 262.11 and 262.12 (relating to hazardous waste determination and identification numbers), 25 PA Code 262.20-262.23 (relating to manifesting requirements for offsite shipments of spent carbon or other hazardous wastes), and 25 PA Code § § 262.30 - 262.34 (relating to pretransport requirements); 25 PA Code § § 263.10 - 263.31 (relating to transporters of hazardous wastes); and with respect to the operations at the Site generally, with the substantive requirements of PA Code § § 264.10 - 264.56 and 264.170 - 264.178 (in the event that hazardous waste generated as part of the remedy is managed in containers), 25 PA Code § § 264.190 - 264.199 (in the event that hazardous waste is managed, treated, or stored in tanks); and if prohibited by land disposal restrictions, 40 CFR Part 268. EPA does not presently have sufficient information to determine whether the constituents are hazardous wastes; however, as noted above, EPA shall require the performance of kepone and TCLP testing to address this and 40 CFR § 268.50 (prohibitions on storage of hazardous waste) which are relevant and appropriate.

Long-term Effectiveness and Permanence. Alternative SS-2 provides a high level of long-term effectiveness and permanence because it will result in the permanent removal of the contaminants of concern in the soils at the Site. However, SS-2 may not be feasible in some locations since the facility must remain operational. Alternative SS-3 may be effective for meeting clean-up goals in specific areas. The degree of effectiveness attained by SS-3, however, must be verified by a post-treatment soil sampling method which is less reliable than the post-excavation soil sampling method associated with SS-2.

Reduction of Toxicity, Mobility, or Volume through Treatment. Alternatives SS-2 and SS-3 will result in permanent reduction in the toxicity, mobility, and volume of the contaminants of concern at the Site because the contaminants will either be permanently destroyed or removed from the Site. However, SS-2 cannot be performed in the plant area and SS-3 has very limited application at the Site.

Short-term Effectiveness. Alternative SS-3 will have fewer short-term impacts associated with Site disturbance. Short-term impacts associated with Alternative SS-2 include the disruption of the Site associated with removing and replacing soil, and physical risks involved in any activities where heavy equipment is used. Implementation of SS-2 would require less time than SS-3, because excavation requires less time to implement than soil vapor extraction. SS-2 has limited risks associated with the excavation and hauling of soils with contaminants of concern. SS-3 has greater potential exposure risks associated with implementation, due to the drilling and removal of VOCs from the soil. The off-gas from the SVE system will require monitoring to ensure that it complies with relevant health-based standards.

Implementability. The excavation alternative (SS-2) does not require specialized equipment and uses routine construction procedures so it is easily implemented. SS-2 will require personnel experienced in hazardous materials handling and transport. Soil Vapor Extraction (SS-3) requires experienced personnel and specialized equipment. Furthermore, SVE may not be feasible at the Site and can only be used in specific areas. The low hydraulic conductivity of the soils (about 10-7 cm/s) and the perched water table conditions make this alternative potentially infeasible. Difficulties may also be encountered by the expected need for hydrofracturing near an active plant building, and placement of the SVE piping through the plant area.

A pilot study should be performed to provide data to support the design of an SVE well system.

Cost. Capital and operation and maintenance costs are summarized in Table 10. The Soil Vapor Extraction alternative (SS-3) would have the lower net present-worth costs at $2,477,000 when compared to SS-2.

9.3 Comparative Analysis of Alternatives for Freshwater Drainage Ditch Surface Water

Overall Protection. With Alternative FWDD/SW-1, contaminants of concern will continue to exceed chemical-specific ARARs and potentially migrate in the surface water. Therefore, it will not be discussed in the remainder of this analysis. FWDD/SW-2A and 2B (Source Control) is to reduce loading of contaminants of concern to the freshwater drainage ditch surface water. Both of these alternatives will accomplish this by a combination of improvements to the surface water collection and discharge systems at the Site and continued material management at the plant. Material management programs implemented at the Site include: a waste minimization program, a spill prevention and contingency plan, strict hazardous material handling protocols, and a best management practices program. FWDD/SW-2A and 2B both include changes to the physical surface water system by diverting drain discharges to the treatment plant for collection, replacing the underground lines discharging to the freshwater drainage ditch, and upgrading the surface water management plan.

Compliance with ARARs. Both alternatives FWDD/SW-2A and 2B will reduce loading of contaminants of concern to the freshwater drainage ditch surface water. Improvements to the existing storm water drainage system, or redesign of the system will meet the action-specific requirements of the county's stormwater management plan under the Pennsylvania Storm Water Management Act (32 P.S. § § 680.1 - 680.5 and § 680.13, and 25 PA Code 111.14). Construction of the improvements and regrading will be performed in accordance with Soil and Water Conservation Regulations (Title 25, PA Code Chapter 102.1 - 102.32) to meet the requirements of the control of soil erosion and sedimentation resulting from earthmoving activities. The discharge of storm water will meet the requirements of the Pennsylvania NPDES Regulations (25 PA Code § § 92.1, 92.3 - 92.11, 92.17, and 92.41).

Long-term Effectiveness and Permanence. Alternatives FWDD/SW-2A and 2B will both be effective in the long-term. However, FWDD-2A will provide additional permanence since the existing surface water drainage pipes will be reconstructed and not plugged as in FWDD/SW-2B.

Reduction of Toxicity, Mobility, or Volume through Treatment. Neither alternative FWDD/SW-2A nor FWDD/SW-2B actively reduces the toxicity, mobility, or volume of contaminants of concern at the Site. These alternatives are designed to keep contaminants of concern out of the freshwater drainage ditch surface water.

Short-term Effectiveness. The implementation of Alternative FWDD/SW-2A may have potential short-term impacts. Reconstruction of the underground discharge lines to the freshwater drainage ditch could have some risks associated with encountering contaminants of concern in the excavations, potential release of VOCs, potential release of contaminants of concern to the surface or freshwater drainage ditch surface water, confined work space, encountering buried utilities during excavation, and excavation/shoring collapse. Both Alternatives FWDD/SW-2A and 2B have a short implementation period.

Implementability. Both Alternatives FWDD/SW-2A and 2B are easily implementable since operational practices and/or procedures are already developed. Reconstruction of the discharge lines under either alternative will entail disruption of operations to access, plug, and/or reconstruct the lines.

Cost. Capital and operation and maintenance costs are summarized in Table 10. The Source Control Alternative which replaces the surface water drainage pipes with an aboveground system (FWDD/SW-2B) would have lower net present-worth cost of $1,223,000 when compared to FWDD/SW-2A.

9.4 Comparative Analysis of Alternatives for Freshwater Drainage Ditch Sediments

Overall Protection. EPA has developed cleanup levels for all contaminants of concern with the objective of removing contaminated soil that has the potential to migrate to groundwater. In addition, soil cleanup levels for mirex and kepone that are protective of environmental receptors have been established by EPA and are set at 10 :g/kg. Alternative FWDD/SED-1 (No Further Action) will neither eliminate nor reduce the sediment contamination to acceptable levels, except by natural attenuation. Therefore, it will not be discussed further. Alternative FWDD/SED-2 (Excavation and Soil Lined Ditch) will provide the highest level of protectiveness because it will result in permanent removal of all contaminants of concern from the sediments in the freshwater drainage ditch at the Site. Alternative FWDD/SED-3 (Limited Excavation and Concrete Lined Ditch) is less protective since some sediments containing contaminants of concern would remain in the ditch.

Compliance with ARARs. There are no ARARs that are pertinent for the development of clean-up levels for the contaminated sediments at the Site. The equations used to develop soil clean-up criteria for contaminants of concern in soil for the site require the use of an acceptable standard for groundwater. The groundwater criteria are used to back calculate the soil criteria. Section 264.97(i), (j) and 264.100(a)(9) of Title 25 of the Pennsylvania Code sets forth standards that are ARARs for groundwater. The Commonwealth of Pennsylvania maintains that this requirement to remediate to background is found in other legal sources. In addition, the Pennsylvania Department of Environmental Resources document entitled "Cleanup Standards for Contaminated Soils", dated December 1993, is a "To Be Considered" (TBC) requirement that establishes soil cleanup standards deemed to be acceptable under the residual waste regulations. The regulation and the guidance document were used in the development of the sediment clean-up criteria. Alternatives FWDD/SED-2 and FWDD/SED-3 will meet the sediment clean-up criteria. However, Alternative FWDD/SED-3 is a limited excavation and the drainage ditch will be lined with concrete to reduce leaching of contaminants of concern into groundwater.

Kepone is an origin RCRA listed waste as discarded material U142 and is addressed under RCRA in 40 C.F.R. Part 268 which describes the prohibitions on land disposal of various hazardous wastes. Since contaminants will exist in the sediment excavated under Alternatives FWDD/SED-2 and FWDD/SED-3, the sediment will be first be tested to determine if kepone levels are above the health-based risk concentration of 160 ppb. If kepone concentrations are below 160 ppb, the sediment will be tested to determine if it is a RCRA characteristic waste in accordance with 40 C.F.R. § 261.24 by the Toxic Characteristic Leaching Procedure ("TCLP"). If it is determined to be hazardous waste or kepone concentrations are above 160 ppb, the remedy will be implemented consistently with the substantive requirements, which are relevant and appropriate, of PA Code § § 262.11 and 262.12 (relating to hazardous waste determination and identification numbers), 25 PA Code 262.20-262.23 (relating to manifesting requirements for offsite shipments of spent carbon or other hazardous wastes), and 25 PA Code § § 262.30 - 262.34 (relating to pretransport requirements); 25 PA Code §§ 263.10 - 263.31 (relating to transporters of hazardous wastes); and with respect to the operations at the Site generally, with the substantive requirements of PA Code §§ 264.10 - 264.56 and 264.170 - 264.178 (in the event that hazardous waste generated as part of the remedy is managed in containers), 25 PA Code §§ 264.190 - 264.199 (in the event that hazardous waste is managed, treated, or stored in tanks); and if prohibited by land disposal restrictions, 40 CFR §§ 268.1 - 268.6, 268.8 - 268.9, 268.30 - 268.37, 268.40 - 268.43, and 268.50. EPA does not presently have sufficient information to determine whether the constituents are hazardous wastes; however, as noted above, EPA shall require the performance of TCLP testing to determine whether the constituents fail TCLP.

Long-term Effectiveness and Permanence. Alternative FWDD/SED-2 provides a high level of long-term effectiveness and permanence because it will result in the permanent removal of the contaminants of concern in the sediments at the Site. Alternative FWDD/SED-3 will also be effective but will leave some sediments containing contaminants of concern in the drainage ditch since excavation is limited to the top 6 to 12 inches.

Reduction of Toxicity, Mobility, or Volume through Treatment. Alternative FWDD/SED-2 will result in a permanent reduction in the toxicity, mobility, and volume of the contaminants of concern at the Site because the contaminants will be permanently removed from the freshwater drainage ditch. Alternative FWDD/SED-3 will reduce the mobility relative to sediment transport and leaching of contaminants of concern.

Short-term Effectiveness. Alternative FWDD/SED-2 will have the less short-term risks due to the quick reduction in contaminants of concern in the sediments. Short-term impacts associated with Alternatives FWDD/SED-2 and FWDD/SED-3 include the disruption of the freshwater drainage ditch associated with removing sediments and replacing them with soil or concrete and the physical risks involved where heavy equipment is used.

Implementability. Both Alternatives FWDD/SED-2 and FWDD/SED-3 are implementable and utilize standard construction technologies. Both alternatives will require personnel experienced in hazardous material handling and transport.

Cost. Capital and operation and maintenance costs are summarized in Table 10. The Limited Excavation and Concrete Lined Ditch alternative (FWDD/SED-3) would have the lowest net present-worth costs at $454,000.

9.5 Comparative Analysis of Alternatives for Spring Creek Sediments

Overall Protection. EPA has developed soil cleanup levels for mirex and kepone in sediments (10 :g/kg) that are protective of environmental receptors. The Food and Drug Administration (FDA) has established action levels for mirex and kepone in edible portions of fish set at 100 :g/kg and 300 :g/kg, respectively. Since SC-1 (No Action) assumes that the current "catch and release" advisory is no longer in effect for Spring Creek and the other alternatives selected in this interim ROD would not be implemented, it would neither eliminate nor reduce to acceptable levels the threats to human health or the environment presented by contamination at the Site and will not be discussed in the remainder of this analysis. Alternatives SC-2 (Institutional Controls), SC-3 (Dredging), and SC-4 (Lining Stream Channel) would all protect human health because they maintain the "catch and release" fishing advisory. The potential short-term environmental impacts resulting from Alternatives SC-3 and SC-4 would be significant; floodplain, riparian zone, and possibly wetland habitats would be impacted through the construction of access roads, work stations, and stream channel access points. Dredging operations under SC-3 and lining the stream channel under SC-4 would destroy benthic habitats. There may also be some long-term adverse impacts from alternatives SC-3 and SC-4 as a result of resuspension of contaminated sediments.

Compliance with ARARs. There are no chemical-specific ARARs that are pertinent for the development of clean-up levels for the contaminated sediments in Spring Creek. However, EPA has determined that mirex or kepone concentrations of 10 :g/kg is the cleanup level that would be protective of ecological receptors. The technical basis for the cleanup level is based on the toxicity (both for aquatic and terrestrial species), bioaccumulation, and biodegradation of the pesticides.

Alternatives SC-1 and SC-2 do not have any location-specific or action-specific requirements. Since Alternative SC-3 will result in removal of mirex and kepone contaminated sediments, offsite disposal will be in compliance with the requirements contained in 40 CFR §§ 268.1 - 268.6, 268.8 - 268.9, 268.30 - 268.37, 268.40 - 268.43, and 268.50. The remedy will be implemented consistently with the substantive requirements, which are relevant and appropriate, of PA Code §§ 262.11 and 262.12 (relating to hazardous waste determination and identification numbers), 25 PA Code 262.20 - 262.23 (relating to manifesting requirements for offsite shipments of spent carbon or other hazardous wastes), and 25 PA Code §§ 262.30 - 262.34 (relating to pretransport requirements); 25 PA Code §§ 263.10 - 263.31 (relating to transporters of hazardous wastes); and with respect to the operations at the Site generally, with the substantive requirements of PA Code §§ 264.10 - 264.56 and 264.170 - 264.178 (in the event that hazardous waste generated as part of the remedy is managed in containers), 25 PA Code §§ 264.190 - 264.199 (in the event that hazardous waste is managed, treated, or stored in tanks).

Both Alternatives SC-3 and SC-4 will comply with erosion and sedimentation control measures contained in 25 PA Code Chapter 102.1 - 102.32; wetland regulations in 25 PA Code §§ 105.1 - 105.3, 105.12, and 105.19; Pennsylvania water resource regulations in 25 PA Code § 91. Activities which may impact the 100-year floodplain are subject to the technical requirements of the Pennsylvania Flood Plain Management Act of 1978 and the Dam Safety and Encroachment Act of 1978 contained in 25 PA Code §§ 105 and 106. In addition, Spring Creek is considered a water of the Commonwealth and requirements contained in 25 PA Code § 105 and Federal Executive Order 11988 may apply.

Long-term Effectiveness and Permanence. Alternative SC-2 relies on the natural attenuation process; the other alternatives attempt to reduce fish tissue levels to levels where the fishing advisory can be lifted. Alternatives SC-3 and SC-4 may provide a higher degree of long-term effectiveness and permanence as a result of their removal and containment components, respectively. However, due to morphological considerations in Spring Creek, there are concerns regarding the effectiveness of these alternatives to achieve remediation goals. Both SC-3 and SC-4 may leave some impacted sediments in place and both alternatives will cause sediment resuspension.

Reduction of Toxicity, Mobility, or Volume through Treatment. Alternative SC-2 utilizes natural attenuation processes, and Alternatives SC-3 and SC-4 utilize removal and containment actions, respectively, to reduce constituent mobility. None of the alternatives provide treatment for reduction of the toxicity and/or volume of mirex and kepone.

Short-term Effectiveness. Alternative SC-2 does not include any remedial actions which would cause adverse effects to human health or the environment. Alternatives SC-3 and SC-4 will potentially cause several severe adverse impacts to the environment: increased erosion; resuspension and increased transport and bioavailability of buried impacted sediments; destruction of aquatic, riparian zone, and flood plain habitats; increased siltation within wild trout spawning grounds; and, the overall reduction in quality of the wild trout fishery. Both Alternatives SC-3 and SC-4 will result in a similarly high degree of these adverse environmental impacts primarily from the construction of access roads and work stations within the flood plain, riparian zones, and possibly wetlands; construction activities conducted within the stream channel (dredging, backfilling, and containment); and construction of flood control structures along the riparian zone.

Implementability. Both Alternatives SC-3 and SC-4 will be difficult to implement from both a technical and administrative standpoint. The cobbles, boulders, and deep pools in some depositional areas will interfere with effective implementation of both of these alternatives. These alternatives will be further complicated by the requirement for access to creek areas and construction on both sides of Spring Creek. Alternative SC-2 can be easily implemented.

Cost. Alternative SC-2 has the lowest net present-worth cost of $500,000. The estimated present-worth costs of Alternatives SC-3 and SC-4 increase substantially and are summarized in Table 10.

10.0 SELECTED REMEDY: DESCRIPTION AND PERFORMANCE STANDARDS

EPA has selected the following alternatives as the remedy for OU1 at the Centre County Kepone Site: GW/TS-3 (extraction and treatment of groundwater), SS-2 (soil excavation/disposal), FWDD/SW-2A (source control measures), FWDD/SED-2 (sediment excavation/disposal), and SC-2 (institutional controls and monitoring).

The remedy will restore the groundwater in the area of attainment to background levels as established by EPA, in consultation with the Commonwealth of Pennsylvania or to the appropriate MCLs or non-zero MCLGs, whichever is more stringent. The remedy also includes excavation and offsite disposal of contaminated soils and sediments, source control measures for surface water from the Site, and long-term monitoring. This remedy is protective of human health and the environment, is cost-effective, shall meet ARARs, and utilizes treatment technologies to the maximum extent practicable. The remedy includes the following components:

- Extraction and treatment of groundwater with discharge to the freshwater drainage ditch;
- Long-term groundwater monitoring;
- Excavation and offsite disposal of contaminated soils;
- Surficial Soil Sampling of the 15-acre Former Spray Field Area;
- Improvements to the surface water drainage system in the plant production area;
- Engineering controls and hazardous materials management practices for surface water drainage;
- Monitoring of surface water discharge from the Site;
- Excavation and offsite disposal of contaminated sediments;
- Fish tissue and stream channel monitoring;
- onsite and offsite fencing;
- Deed restrictions;
- Riparian-area Sampling, including the drainage channel of Thornton Spring, Section B of the freshwater drainage ditch, and downstream of Benner Fish Hatchery.

Each component of the selected remedy and its performance standards are described below.

10.1 Extraction and Treatment of Groundwater

Description of the Component of the Remedy

The groundwater shall be remediated through extraction and treatment of contaminated groundwater throughout the area of attainment which will be determined during the remedial design phase. The extraction shall create groundwater zones where the contaminated groundwater is hydraulically contained and shall prevent migration beyond the area of attainment. Groundwater shall be treated using an onsite treatment system. The treatment system will be designed to reduce the Site-related contaminants in the extracted groundwater, unattended, on a continuous, 24-hour-per-day performance basis. The exact location, size, and number of wells (both source control and migration control) shall be determined during the design by EPA, in consultation with the Commonwealth of Pennsylvania. At least one round of samples shall be collected from existing Site monitoring wells during the predesign phase, and analyzed for volatile organic compounds, in order to determine the extent of the groundwater contaminant plume at that time. Aquifer tests shall be performed during the predesign phase in order to define aquifer characteristics, if such tests are determined to be necessary by EPA, in consultation with the Commonwealth of Pennsylvania.

The treated groundwater effluent will be discharged to the onsite freshwater drainage ditch through a new outfall pipe that shall be constructed as part of the remedial action. A system to treat contaminated groundwater with GAC shall include water conditioning, solids filtration and handling, and GAC adsorption. The groundwater will be pumped to filters for solids removal, to a decanter for free product separation, and then to GAC columns for adsorption of VOCs. Spent solids from the solids filtration system will be characterized in accordance with the TCLP test set forth at 40 C.F.R. § 261.24. The treatment system will be designed to achieve 98 percent removal of VOCs in compliance with the substantive requirements of PADER's NPDES regulations. Final flow rates and GAC system dimensions will be determined by EPA during remedial design. The final combined pumping rate and the exact location, size, and number of wells shall be based on the ability to hydraulically control the contaminated groundwater plume as determined by EPA.

An operation and maintenance plan shall be developed for the groundwater extraction system and submitted to

EPA for approval during the remedial design phase. At a minimum, the influent and effluent from the treatment facility shall be sampled monthly for volatile organic compounds, and the effluent sampled biannually for mirex, kepone, and photomirex. Operation and maintenance of the groundwater extraction system shall continue for an estimated 30 years or such other time period as EPA, in consultation with the Commonwealth of Pennsylvania, determines to be necessary, based on the statutory reviews of the remedial action which shall be conducted no less often than every five years from the initiation of the remedial action in accordance with the EPA guidance document, Structure and Components of Five-Year Reviews (OSWER Directive 9355.7-02, May 23, 1991). Statutory reviews will be conducted as long as hazardous substances remain onsite and prevent unlimited use and unrestricted access to the Site. The operation and maintenance plan shall be revised after construction of the collection system has been completed if it is determined to be necessary by EPA. The revised operation and maintenance plan shall be submitted to EPA for approval.

In addition, a Baseline Monitoring Plan shall be developed to establish baseline contaminant concentrations for Thornton Spring surface water. The baseline contaminant concentrations for each contaminant of concern will be established prior to commencement of the groundwater extraction system and will be used to evaluate the effectiveness of the system. The Plan shall include, as a minimum, monthly sampling of Thornton Spring surface water with 25% of the samples taken within 12 hours after a storm event and include flow measurements to ensure a quantitative evaluation of the spring's water quality. The exact frequency and duration of sampling and the analytical parameters and methods to be used will be determined by EPA, in consultation with the Commonwealth of Pennsylvania, during the remedial design phase.

A comprehensive analysis of the groundwater extraction system shall be made to determine the thermal effects on Spring Creek.The analysis shall include establishment of Spring Creek background conditions, and modeling of the background data to demonstrate the thermal effects of the dewatering Thornton Spring and discharging treated effluent to Spring Creek via the freshwater drainage ditch. The establishment of background conditions for Spring Creek shall include, at a minimum, temperature and flow readings from three locations: 1) Spring Creek upstream from the confluence of Thornton Spring, 2) Thornton Spring, and 3) Spring Creek at a location 40 meters downstream from the confluence of the freshwater drainage ditch. The exact frequency and duration of measurements and methods to be used will be determined by EPA, in consultation with the Commonwealth of Pennsylvania, during the remedial design phase. The analysis shall be submitted for EPA acceptance and include, if necessary, mitigation plans for maintaining the background thermal regime of Spring Creek.

In addition, existing pumping and monitoring wells which serve no purpose shall be properly plugged and abandoned consistent with PADER's Public Water Supply Manual, Part II, Section 3.3.5.11, in order to eliminate the possibility of these wells acting as a conduit for future groundwater contamination. Wells which may be plugged and abandoned include the pumping wells on the Ruetgers-Nease Corporation property and any well not used or considered by EPA for practical use as part of a long-term groundwater monitoring network. Periodic monitoring of groundwater and Thornton Spring surface water will occur to determine the performance of the pump and treat system and the effectiveness of the selected remedy in meeting the performance standards.

Performance Standards

1. The performance standard for each contaminant of concern in the groundwater in the area of attainment shall be the MCL or the non-zero MCLG for that contaminant [40 C.F.R. Part 141] or the background concentration of that contaminant, whichever is more stringent. The background concentrations for each contaminant of concern shall be established in accordance with the procedures for groundwater monitoring outlined in 25 PA Code § 264.97(i), (j), and 264.100(a)(9), subject to the approval of EPA in consultation with the Commonwealth of Pennsylvania. Establishment of background concentrations shall not delay groundwater extraction and treatment. In the event that a contaminant of concern is not detected in samples taken for the establishment of background concentrations, the detection limit for the method of analysis utilized with respect to that contaminant shall constitute the "background" concentration of the contaminant. The area of attainment (the area in which these performance standards are to be met) will include, as a minimum, the downgradient property boundary of Ruetgers-Nease Corporation, the groundwater contamination beyond the Ruetgers-Nease Corporation property, and Thornton Spring. However, MCLs and MCLGs for these contaminants of concern are listed below.

Contaminant	MCL (:g/l)	MCLG (:g/l)
Benzene	5	0
Chlorofom	100	0
1,2-Dichlorobenzene	600	600
1,1-Dichloroethane	810*	-
1,2-Dichloroethane	5	0
1,1-Dichloroethene	7	7
1,2-Dichloroethene	70	70
1,2-Dichloropropane	5	0
Ethylbenzene	700	700
Tetrachloroethene	5	0
Toluene	1,000	1,000
1,1,1-Trichloroethane	200	200
1,1,2-Trichloroethane	5	3
Trichloroethene	5	0
Vinyl Chloride	2	0
Xylenes	10,000	10,000

* Non-carcinogenic health-based concentration

2. The number and location of recovery wells will be determined by EPA, in consultation with the Commonwealth of Pennsylvania, during the design phase and shall be sufficient to control the migration of contaminants and to achieve the groundwater cleanup levels throughout the area of attainment. The area of attainment for the cleanup will be the area where the more stringent standard, as discussed in the preceding performance standard, for the contaminants are exceeded and will include, as a minimum, the downgradient property boundary of Ruetgers-Nease Corporation, the groundwater contamination beyond the Ruetgers-Nease Corporation property, and Thornton Spring. The exact area of attainment will be determined during the remedial design and shall be subject to EPA approval in consultation with the Commonwealth of Pennsylvania.

3. The performance standard for the treated groundwater prior to discharge to the onsite freshwater drainage ditch shall be compliance with the substantive requirements of the NPDES discharge regulations set forth in 25 PA Code § 92.31, and the Pennsylvania Water Quality Standards (25 PA Code §§ 93.1 - 93.9). Pursuant to the Pennsylvania Department of Environmental Resources' determination, monitoring for all the contaminants of concern shall be required.

4. A Baseline Monitoring Plan shall be developed to establish the baseline contaminant concentrations for Thornton Spring surface water. The baseline contaminant concentrations for each contaminant of concern will be established prior to commencement of the groundwater extraction system and shall be subject to EPA approval, in consultation with the Commonwealth of Pennsylvania. The baseline contaminant concentrations will be used to evaluate the effectiveness of the groundwater extraction system. The Plan shall include, as a minimum, monthly sampling of Thornton Spring surface water with 25% of the samples taken within 12 hours after a storm event and include flow measurements to ensure a qualitative evaluation of the spring's water quality. The exact frequency and duration of sampling and the analytical parameters and methods to be used will be determined by EPA, in consultation with the Commonwealth of Pennsylvania, during the remedial design phase.

5. The performance standard for the surface water at Thornton

Spring shall be no less than a 20% reduction per year of the baseline contaminant concentrations established during the design of this component of the remedy over a five year period or compliance with the substantive requirements of the NPDES discharge regulations set forth in 25 PA Code § 92.31, and the Pennsylvania Water Quality Standards (25 PA Code §§ 93.1 - 93.9). Pursuant to the Pennsylvania

Department of Environmental Resources' determination, monitoring for all the contaminants of concern shall be required.

6. Operation and maintenance of the groundwater extraction system shall continue until such time as EPA, in consultation with the Commonwealth of Pennsylvania, determines that the performance standard for each contaminant of concern has been achieved throughout the area of attainment. If EPA and the Commonwealth make such a determination, the monitoring wells shall be sampled for twelve consecutive quarters throughout the area of attainment and if contaminants remain at or below the performance standards, the operation of the extraction system may be discontinued. Semi-annual monitoring of the groundwater shall continue for five years after the system is shut down. Semi-annual monitoring shall continue until EPA, in consultation with the Commonwealth of Pennsylvania, determines that the performance standard for each contaminant of concern can be achieved on a continuing basis. If subsequent to an extraction system shutdown, monitoring shows that groundwater concentrations of any contaminant of concern are above the performance standard, the system shall be restarted and continued until the performance standards have once more been attained for twelve consecutive quarters.

7. The management and ultimate disposition of the spent carbon and the associated hazardous substances from the granular activated carbon units shall not degrade air quality nor contribute to ground-level ozone formation and will be determined, subject to EPA approval, during the remedial design. Such management will entail treatment and/or disposal of the carbon filters. In the event that these units are a hazardous waste, the following ARARs will apply as the Performance Standard for onsite activities: 25 PA Code §§ 262.11 - 262.13 (relating to hazardous waste determination and identification numbers), 25 PA Code §§ 262.20 - 262.23 (relating to manifesting requirements for offsite shipments of spent carbon or other hazardous wastes); and with respect to the operations at the Site generally, with the substantive requirements of 25 PA Code §§ 264.190 - 264.199 (in the event that hazardous waste is managed, treated, or stored in tanks).

8. The background thermal regime of Spring Creek shall be maintained during the operation of the groundwater pump and treat system. The background temperatures and flow conditions for Spring Creek shall be established during the remedial design subject to approval of EPA in consultation with the Commonwealth of Pennsylvania.

Groundwater Remedy Implementation

Because the selected remedy will result in contaminants remaining onsite, 5-year reviews under Section 121(c) of CERCLA will be required.

An operation and maintenance plan for the groundwater extraction and treatment system, including long-term groundwater and Thornton Spring surface water monitoring, shall also be required. The performance of the groundwater extraction and treatment system shall be carefully monitored on a regular basis, as described in the long-term groundwater and Thornton Spring surface water monitoring component below, and the system may be modified, as warranted by the performance data collected during operation. These modifications may include, for example, alternate pumping of extraction wells and the addition or elimination of certain extraction wells. In addition, the extraction/treatment alternatives GW/TS-3 and GW/TS-4 rated relatively even against all of the criteria except the cost criterion. Consequently, if, based on the more detailed information gathered during remedy implementation or operation, variations occur (such as a change in the contaminant concentration or flow rate), EPA may consider the utilization of a combination of the groundwater treatment technologies under Alternatives GW/TS-3 and GW/TS-4.

It may become apparent during implementation or operation of the groundwater extraction system and its modifications, that contaminant levels have ceased to decline and are remaining constant at levels higher than the performance standards over some portion of the area of attainment. If EPA, in consultation with the Commonwealth of Pennsylvania, determines that implementation of the selected remedy demonstrates, in corroboration with hydrogeological and chemical evidence, that it will be technically impracticable to achieve and maintain the performance standards throughout the entire area of attainment, EPA, in consultation with the Commonwealth of Pennsylvania may require that any or all of the following measures be taken, for an indefinite period of time, as further modification(s) of the existing system:

a) long-term gradient control provided by low level pumping, as a containment measure;

b) chemical-specific ARARs may be waived for those portions of the aquifer for which EPA, in consultation with the Commonwealth of Pennsylvania, determine that it is technically impracticable to achieve such ARARs;

c) institutional controls may be provided/maintained to restrict access to those portions of the aquifer where contaminants remain above performance standards; and

d) remedial technologies for groundwater restoration may be reevaluated.

EPA, in consultation with the Commonwealth of Pennsylvania, may make the decision to invoke any or all of these measures during implementation or operation of the remedy or during the 5-year reviews of the remedial action. If such a decision is made, EPA shall amend the ROD or issue an Explanation of Significant Differences.

10.2 Long-Term Groundwater Monitoring

Description of the Component of the Remedy

A long-term groundwater monitoring program, which includes Thornton Spring surface water, shall be implemented to evaluate the effectiveness of the groundwater pumping and treatment system. A plan for the long-term groundwater monitoring program shall be included in the operation and maintenance plan for the groundwater extraction and treatment system. The number and locations of monitoring wells, including any additional wells to those already in existence, which are necessary to verify the performance of the remedial action will be determined during the remedial design and shall be subject to EPA approval, in consultation with the Commonwealth of Pennsylvania.

Groundwater from the monitoring wells and Thornton Spring surface water shall be sampled quarterly for volatile organic compounds, annually for mirex and kepone, and biannually for photomirex. Sampling shall continue until such time as EPA, in consultation with the Commonwealth of Pennsylvania, determine that the performance standard for each contaminant of concern has been achieved throughout the area of groundwater contamination.

Performance Standards

1. The performance standard for this component of the remedy is the preparation and EPA acceptance of a Long-Term Groundwater Monitoring Program. The Program must include, but not be limited to, monitoring of groundwater from monitoring wells and Thornton Spring surface water on a quarterly basis for VOCs, annually for mirex and kepone, and biannually for photomirex. The specific monitoring wells to be sampled will be provided in the Long-Term Groundwater Monitoring Program and subject to EPA review and approval in consultation with the Commonwealth of Pennsylvania.

2. In the event EPA and the Commonwealth of Pennsylvania determine that the performance standard for each contaminant of concern has been achieved throughout the area of attainment, as discussed in the performance standards contained in Section 10.1, the monitoring wells shall continue to be sampled for twelve consecutive quarters. If contaminants remain at or below the performance standards, the operation of the extraction system may be discontinued.

3. Semi-annual monitoring of the groundwater shall continue for five years after the system is shut down. Semi-annual monitoring shall continue until EPA, in consultation with the Commonwealth of Pennsylvania, determines that the performance standard for each contaminant of concern can be achieved on a continuing basis.

10.3 Excavation and Offsite Disposal of Contaminated Soils

Description of the Component of the Remedy

This portion of the remedy consists of excavation and offsite disposal of an estimated 6,000 cubic yards of contaminated soil from a minimum of three areas: the Former Drum Staging Area, the Designated Outdoor Storage Area, and the Tank Farm/Building #1 Area. All excavated soils containing kepone above 160 ppb for offsite disposal will be considered a RCRA listed waste as discarded material U142. Soils requiring removal shall also be subjected to the Toxicity Characteristic Leaching Procedure (TCLP) as described in 40 C.F.R. Part 261, Appendix II, prior to disposal at an offsite RCRA permitted subtitle C hazardous waste landfill. If required, offsite thermal treatment of the excavated soil would be used to meet RCRA land disposal regulations. Excavation will continue until the soil left in place meets the soil clean-up levels that are protective of groundwater as shown in Table 9.

Any asphalt and subbase in the excavation area described above will be removed and staged for offsite disposal as construction debris. Excavation will then begin using a backhoe, and the sides of the excavation area will be cut back to a minimum 2 to 1 slope to prevent side wall failure. Temporary shoring or engineering measures may be required in areas near existing structures to maintain structural stability. Excavation will continue to a depth of 8 feet or shallower if bedrock is encountered. Soil removed during this phase of the excavation will be stockpiled at a location approved by EPA pending sample analyses and, if analyses show that this soil has concentrations of VOCs, mirex, and kepone that are protective of groundwater, it will be utilized for replacement material after excavation activities are complete.

All soil from the 8 to 12 foot depth interval, and any additional soil containing concentrations of VOCs, mirex, and kepone that are not protective of groundwater, will be removed in lifts and loaded onto vehicles for transport to an offsite RCRA permitted subtitle C hazardous waste landfill. Sediment and erosion controls and temporary covers will be installed to protect exposed soil from the effects of weather consistent with PADER's Bureau of Soil and Water Conservation Erosion and Sediment Pollution Control Manual.

Post-excavation sampling will be performed after the excavation has progressed to 12 feet. Post-excavation samples will be obtained from the base and the sidewalls of the excavation to ensure that contamination is not present above the clean-up level. The location of the post-excavation samples will be selected based on visual observation of lithology and screening for VOCs using an appropriate organic vapor detector. The samples will be analyzed for VOCs on a quick turnaround basis using a method approved by EPA. If the post-excavation sample concentrations are below the clean-up level, the excavation will be backfilled using the stockpiled clean soil. Additional clean borrow material will be brought in to restore the excavation to original grade, and the asphalt surface will be repaired. Backfilling will be performed in 6-to-12 inch lifts, and the material will be compacted to minimize the potential for subsidence.

If VOCs are detected at levels above being protective of groundwater in the post-excavation samples, additional material will be removed from the excavation area and new samples obtained for analysis as discussed above. Excavation and sampling activities will continue until the results indicate that the soils do not contain contaminants of concern above the clean-up level. The excavation area will then be restored as described in the preceding paragraph.

In addition, surficial and deep soil samples shall be collected in the inactive or unobstructed areas of the Tank Farm/Building #1 Area, including the upgradient of the freshwater drainage ditch and the unoccupied portions of the tank farm. These areas were not fully characterized in the Remedial Investigation and were determined in the Feasibility Study to be disruptive of plant operations should excavations occur. The purpose of the sampling will be to fully characterize the soils and assess the need for additional excavation. The number and location of the soil samples, and the analytical parameters and methods to be used will be determined by EPA, in consultation with the Commonwealth of Pennsylvania, during the remedial design phase.

Performance Standards

1. The performance standard for this component of the remedy is to remove all soils with concentrations of contaminants of concern that are above levels protective of groundwater from a minimum of three areas: the Former Drum Staging Area, the Designated Outdoor Storage Area, and the Tank Farm/Building #1 Area. Figure 12 illustrates the general location of these areas. The exact areas targeted for soil removal shall be determined during the remedial design and shall be subject to approval of EPA in consultation with the Commonwealth of Pennsylvania. Table 9 provides the listing of the contaminants of concern at the Site and the appropriate soil clean-up level.

2. Excavated soils containing kepone above the risk based concentration of 160 :g/kg will be considered a RCRA listed waste as discarded material U142. Soils requiring removal shall also be subjected to the Toxicity Characteristic Leaching Procedure (TCLP) as described in 40 C.F.R. Part 261, Appendix II, prior to disposal at an offsite RCRA permitted subtitle C hazardous waste landfill. The federal land disposal restrictions contained in 40 C.F.R. §§ 268.1 - 268.6, 268.8 - 268.9, 268.30 - 268.37, and 268.40 - 268.43 shall apply to the offsite disposal of any soils found to exhibit the characteristic of a hazardous waste. Figure 13 provides an example of a decision tree type approach for the ultimate disposition of soils removed from the Site. A plan for the disposition of soils shall be determined during remedial design and shall be subject to approval of EPA in consultation with the Commonwealth of Pennsylvania.

3. Exposed soil from the Site shall be protected from the effects of weather and comply with the PADER's Bureau of Soil and Water Conservation Erosion and Sediment Pollution Control Manual.

4. The performance standard for this component of the remedy shall include preparation and EPA acceptance of a surficial and deep soil sampling program in the Tank Farm/Building #1 Area. The sampling program must include, but not be limited to, sampling of the soils in the inactive or unobstructed areas of the Tank Farm/Building #1 area. The specific number and location of soil samples, and the analytical parameters and methods to be used shall be provided in the sampling program and shall be subject to EPA review and approval in consultation with the Commonwealth of Pennsylvania.

10.4 Spray Field Surficial Soil Sampling

Description of the Component of the Remedy

During the Remedial Investigation, levels of mirex and kepone were detected in the surficial soil samples from the 15-acre spray field area that may be capable of causing adverse ecological effects. However, the extent of these compounds in surface soils were not well characterized during the Remedial Investigation. A surficial soil sampling program for the 15-acre spray field area shall be implemented in order to: (1) evaluate the environmental risks from the surficial soils; and (2) assess the need for additional biological studies or remedial action. Figure 14 illustrates the area defined as the 15-acre former spray field area.

Performance Standards

1. A minimum of 45 surface soil samples, excluding QA/QC samples shall be collected from the 15-acre spray field area and analyzed for mirex, photomirex, and kepone. The exact number and location of samples for the surficial soil sampling program for the 15-acre spray field area shall be determined during the remedial design phase and shall be subject to EPA approval in consultation with the Commonwealth of Pennsylvania.

2. EPA acceptance of a report summarizing the data generated from the surficial soil sampling program including calculation of environmental risks and the need for additional biological studies or remedial action.

10.5 Improvements to the Surface Water Drainage System

Description of the Component of the Remedy

Stormwater runoff from the Site is discharged to the surface water drainage system through the freshwater drainage ditch. Improvements shall be made to the existing surface water drainage system to eliminate potential groundwater infiltration into the underground piping.

Performance Standards

1. The engineering method to eliminate groundwater infiltration shall be determined during the remedial design and shall be subject to approval by EPA, in consultation with the Commonwealth of Pennsylvania.

2. The performance standard for this component of the remedy is as follows: upon completion of the engineering method to eliminate groundwater infiltration, all underground piping will be evaluated using video cameras or similar investigative equipment. The purpose of the evaluation is to insure that groundwater is not infiltrating into the underground piping. A report detailing the evaluation shall be submitted to EPA and the Commonwealth of Pennsylvania. Repairs will be performed as EPA in consultation with the Commonwealth of Pennsylvania determines necessary to eliminate any leakage of groundwater into the underground pipes. The evaluation will be repeated every three (3) years as part of the operation and maintenance until the groundwater meets the Performance Standards described in Section 10.1.

10.6 Engineering Controls and Hazardous Materials Management for Surface Water Drainage

Description of the Component of the Remedy

Engineering controls to reduce the potential for any inadvertent release of hazardous substances from entering the freshwater drainage ditch shall be implemented at the Site. These engineering controls shall include, but are not limited to: (1) stormwater collected from the active tank farm secondary containment system and roof drains from production buildings will be channeled to the groundwater treatment plant for treatment prior to discharge to the freshwater drainage ditch; (2) secondary containment systems will be provided for various areas in the production area (such as the outdoor material substance container storage, tank storage, and trailer loading/unloading areas) and these systems will be coated with an impermeable/wear resistant material; (3) the discharge system to the freshwater drainage ditch from the treatment plant and stormwater catch basins will be improved; (4) the use of stormwater catch basin covers, which are employed in the event of a spill, will be maintained; and (5) regrading of unpaved surfaces in the plant production area will be performed to enhance storm water runoff.

In addition, a Hazardous Materials Management Practices Program will be developed for the Site to reduce the potential for releases. The hazardous materials management practices program will include a waste minimization program, and a spill contingency program.

Performance Standards

1. The performance standard for this component of the remedy shall be the preparation of a Surface Water Drainage Control Plan which addresses at a minimum, items 1 through 5 described above. The exact engineering controls to be implemented shall be determined during the remedial design and shall be subject to EPA approval, in consultation with the Commonwealth of Pennsylvania.

2. The performance standard shall include the preparation of a Hazardous Materials Management Practices Program. The Program shall be developed during the remedial design and shall be subject to EPA approval, in consultation with the Commonwealth of Pennsylvania.

10.7 Monitoring of Surface Water Discharge

Description of the Component of the Remedy

A long-term surface water monitoring program for the freshwater drainage ditch shall be implemented to evaluate the effectiveness of the improvements made to the surface water discharge system and NPDES requirements. A plan for the long-term surface water monitoring program shall be included in the operation and maintenance plan for the groundwater extraction and treatment system. EPA will determine the number of monitoring points necessary to verify the performance of the remedial action. At a minimum, the freshwater drainage ditch discharge will be sampled quarterly for VOCs and select inorganics, and biannually for mirex, kepone, and photomirex. Numbers and locations of these monitoring points shall be subject to EPA approval during the remedial design, in consultation with the Commonwealth of Pennsylvania.

Performance Standards

1. The performance standard for this component of the remedy is the preparation and EPA acceptance of a Surface Water Monitoring Program. The Program must include, but not be limited to, monitoring of the groundwater extraction and treatment system in compliance with the NPDES requirements, quarterly sampling of the freshwater drainage ditch discharge for VOCs and select inorganics, and biannual sampling for mirex, kepone, and photomirex. The specific location of the monitoring points will be provided in the Surface Water Monitoring Program and subject to EPA review and approval in consultation with the Commonwealth of Pennsylvania.

10.8 Excavation and Offsite Disposal of Contaminated Sediments

Description of the Component of the Remedy

This portion of the remedy consists of excavation and offsite disposal of impacted sediments/soils from the freshwater drainage ditch on the Ruetgers-Nease property (Section A) to a RCRA permitted subtitle C hazardous waste landfill. To be protective of environmental receptors, the sediments/soils from the upper 24" of the drainage ditch will be removed. Excavation of sediments/soils will continue until the sediments/soils left in place meet the soil and sediment clean-up levels that EPA has determined are protective of groundwater as set forth in Table 9. The depth of excavation may be limited by the occurrence of bedrock.

Sediment samples shall be collected and analyzed for VOCs, mirex, and kepone during the remedial design in order to determine the exact area and volume of soils requiring removal. Sediments requiring removal shall undergo a TCLP test as described in 40 C.F.R. Part 261, Appendix II, prior to offsite disposal in order to determine whether those sediments exhibit the characteristic of toxicity. All excavated sediments containing kepone above 160 ppb for offsite disposal will be considered a RCRA listed waste as discarded material U142. If required, thermal treatment of the excavated sediment would be used to meet RCRA land disposal regulations.

Post-excavation sampling will be performed after the excavation is completed. Post-excavation samples will be obtained from the base and the sidewalls of the ditch to ensure that contamination is not present above the clean-up level. The location of the post-excavation samples will be selected based on visual observation of lithology and screening for VOCs using an appropriate organic vapor detector. The samples will be analyzed for VOCs on a quick turnaround basis using a method approved by EPA. If the post-excavation sample concentrations are below the clean-up level, the excavated area will be backfilled using clean soil. Additional clean borrow material will be brought in to restore the excavation to original grade.

If VOCs are detected at levels above being protective of groundwater in the post-excavation samples, additional material will be removed from the excavation area, and new samples obtained for analysis as discussed above. Excavation and sampling activities will continue until the results indicate that the sediments/soils do not contain contaminants of concern above the clean-up levels. The excavation area will then be restored as described in the preceding paragraph.

Performance Standards

1. The performance standard for this component of the remedy is to remove all sediments/soils from the upper 24" of Section A of the freshwater drainage ditch to be protective of environmental receptors. Excavation of sediments/soils shall continue until the sediments/soils left in place meet the soil and sediment clean-up levels that EPA has determined are protective of groundwater as set forth in Table 9. The depth of excavation may be limited by the occurrence of bedrock. The exact areas targeted for removal shall be determined during the remedial design and shall be subject to approval of EPA in consultation with the Commonwealth of Pennsylvania.

2. Excavated soils containing kepone above the risk based concentration of 160 :g/kg will be considered a RCRA listed waste as discarded material U142. Soils requiring removal shall also be subjected to the Toxicity Characteristic Leaching Procedure (TCLP) as described in 40 C.F.R. Part 261, Appendix II, prior to disposal at an offsite RCRA permitted subtitle C hazardous waste landfill. The federal land disposal restrictions contained in 40 C.F.R. Part 268 shall apply to the offsite disposal of any soils found to exhibit the characteristic of a hazardous waste. Figure 13 provides a decision tree type approach for the ultimate disposition of soils removed from the Site.

3. Exposed sediments from the freshwater drainage ditch shall be protected from the effects of weather and comply with the PADER's Bureau of Soil and Water Conservation Erosion and Sediment Pollution Control Manual.

4. The performance standard shall include preparation and EPA acceptance of a monitoring plan for the sediments in Section A of the drainage ditch after the remedial action is complete to assure that the residual contamination remains in place and does not migrate. The exact number and location of samples from Section A of the drainage ditch shall be determined during the remedial design phase and shall be subject to EPA approval in consultation with the Commonwealth of Pennsylvania.

10.9 Fish Tissue and Stream Channel Monitoring

Description of the Component of the Remedy

A Spring Creek fish tissue and sediment monitoring program shall be implemented during the remediation phase. The program will provide data to evaluate the contamination trends of Spring Creek to determine whether the fishing advisory may be lifted in the future. Stream channel sediment monitoring will provide data to assess the progress of the natural attenuation and sediment deposition processes. EPA, in consultation with the Commonwealth of Pennsylvania, will determine the number and location of sediment samples and fish tissue analyses to be included in the monitoring program during the remedial design phase. The frequency and duration of sampling and the analytical parameters and methods to be used will be determined by EPA, in consultation with the Commonwealth of Pennsylvania, during the remedial design phase.

In the event that fish tissue levels decrease to below the established FDA action levels of 100 :g/kg for mirex and 300 :g/kg for kepone, an intensive Short-Term Fish Tissue Survey will be required to support cancelling the "No-Kill Zone" on Spring Creek. The Survey will be petitioned by the PRP(s) and EPA, in consultation with the State of Pennsylvania and will determine number of species, location, and sampling frequency to be included in the Survey.

Performance Standards

1. The performance standard for this component of the remedy is the preparation and EPA acceptance of a Spring Creek Fish Tissue and Sediment Monitoring Program. The Monitoring Program must include, but not be limited to, annual monitoring of the Spring Creek sediments and fish tissue for mirex and kepone. No less than six (6) sediment samples and 6 biota (3 upper trophic and 3 lower trophic) samples shall be taken from Spring Creek during preferred seasons of March/April or August/October. The specific location of the monitoring points and the sampling season shall be provided in the Monitoring Program and is subject to EPA review and approval in consultation with the Commonwealth of Pennsylvania.

2. The performance standard for fish tissue sampling is that it be done according to Pennsylvania Department of Environmental Resources protocol (PADER publication #33).

3. Monitoring of fish tissue and Spring Creek sediments shall continue for an estimated 30 years or such other time period as EPA, in consultation with the Commonwealth of Pennsylvania, determine to be necessary based on the statutory review of the remedial action which shall be conducted no less often than every five years from initiation of the remedial action in accordance with the EPA guidance document, Structure and Components of Five-Year Reviews (OSWER Directive 9355.7-02, May 23, 1991).

4. In the event that fish tissue levels decrease to below the established FDA Action Levels for mirex and kepone of 100 :g/kg and 300 :g/kg, respectively, the PRP(s) may petition to conduct an intensive Short-Term Fish Tissue Survey to support cancelling the "No-Kill Zone" on Spring Creek. The performance standard for this component of the remedy, is the preparation and EPA acceptance of a Short-Term Fish Tissue Survey. The Survey must include fish tissue sampling from a minimum of two (2) biota (brown trout and white suckers) during the March/April and August/October seasons from a minimum of five (5) locations. The specific location of the monitoring points will be provided in the Survey and subject to EPA review and approval in consultation with the Commonwealth of Pennsylvania.

10.10 Onsite and Offsite Fencing

Description of the Component of the Remedy

The chain-link fence on the Ruetgers-Nease Corporation's property shall be extended to include the former spray field and the former drum staging areas in order to prevent unauthorized access to the Site. In addition, a chain-link fence shall be constructed around Thornton Spring and its' drainageway channel.

Performance Standards

1. A chain-link fence shall be extended on the Ruetgers-Nease Corporation's property to include the former spray field and the former drum storage areas. In addition, a chain-link fence shall be constructed around Thornton Spring and it's drainageway channel. The fence shall have a minimum height of six feet and shall be equipped with a locking gate(s). The exact location and specifications of the fence shall be determined during remedial design and is subject to EPA approval in consultation with the Commonwealth of Pennsylvania.

2. A plan for the maintenance of the fenced areas shall be submitted to EPA and the Commonwealth of Pennsylvania for approval during the remedial design phase.

3. The fence shall be maintained until such time as EPA, in consultation with the Commonwealth of Pennsylvania, determines that access restrictions are no longer required.

10.11 Deed Restrictions

Description and Performance Standard for the Component of the Remedy

Within 30 days after the lodging of Consent Decree, restrictions shall be placed on the deed of the Site (Ruetgers-Nease Corporation) to prohibit: (1) use of the property for residential, commercial, or agricultural purposes; and, (2) the use of onsite groundwater for domestic purposes, including drinking water. The deed restrictions shall remain in effect until EPA, in consultation with the Commonwealth of Pennsylvania, determines that they are no longer required to protect human health and welfare, and the environment.

10.12 Riparian-Area Sampling

Description of the Component of the Remedy

Limited data was available from riparian-area soils of Spring Creek during the Remedial Investigation. A sampling program for riparian-area soils shall be implemented in order to: (1) evaluate Site impacts on the riparian-area soils of Spring Creek, including the lower portion of the freshwater drainage ditch (Section B), the Thornton Spring outlet and drainage channel, and the depositional area of beyond the Benner Fish Hatchery; (2) assess environmental risk from the floodplain sediments; and (3) determine the need for additional remedial action.

Soils and sediment samples shall be collected from the riparian-areas of Spring Creek, the lower portion of the freshwater drainage ditch, the Thornton Spring outlet and drainage channel, and the depositional areas of beyond the Benner Fish Hatchery. The exact number and location of samples will be determined by EPA, in consultation with the Commonwealth of Pennsylvania, during the remedial design phase. These samples shall be analyzed for mirex, photomirex, and kepone.

Performance Standards

1. A work plan for the sampling of the riparian-area soils of Spring Creek, including the lower portion of the freshwater drainage ditch (Section B), the Thornton Spring outlet and drainage channel, and the depositional areas beyond the Benner Fish Hatchery shall be prepared. The exact number and location of samples and the analytical parameters and methods to be used will be determined by EPA, in consultation with the Commonwealth of Pennsylvania during the remedial design phase.

2. EPA acceptance of a report summarizing the data generated from the riparian-area sampling program including calculation of environmental risks from the floodplain sediments and the need for additional biological studies or remedial action.

11.0 STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA, 42 U.S.C. § 9621, establishes several other statutory requirements and preferences. These requirements specify that when complete, the selected remedial action for each site must comply with applicable or relevant and appropriate environmental standards established under federal and state environmental laws (ARARs) unless a statutory waiver is invoked. The selected remedy also must be cost effective and utilize treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that permanently and significantly reduce the volume, toxicity or mobility of hazardous substances. The following sections discuss how the selected remedy for this Site meets these statutory requirements.

11.1 Protection of Human Health and the Environment

Based on the Baseline Human Health Risk Assessment for the Site, measures should be considered to reduce potential risk from four sources: (1) VOCs in groundwater, (2) VOCs in Thornton Spring surface water, (3) mirex in onsite soils, and (4) mirex in recreational fish. These media and contaminants were selected because potential health hazards for some exposure scenarios exceeded a lifetime cancer risk of 10-6 or a non-cancer hazard index of 1. The results of the Environmental Risk Assessment show a potential for risk to ecological receptors for all media examined.

The selected remedy protects human health and the environment by reducing levels of contaminants in the groundwater and Thornton Spring surface water to those required by ARARs through extraction and treatment and by instituting deed restrictions for the Site. The groundwater extraction and treatment system shall reduce the levels of contaminants of concern in the groundwater to achieve MCLs as required by the Safe Drinking Water Act, 42 U.S.C. §§ 300(f) - 300(j) and 40 C.F.R. §§ 141.61 or the background concentrations (the Pennsylvania ARAR under 25 PA Code §§ 264.90 - 262.100, §§ 264.97(i), (j), and 264.100(a)(9)), whichever is more stringent.

The excavation of soil and sediments onsite will protect human health and the environment by removing the contaminated soil, thereby eliminating the potential for contaminant migration to the groundwater and preventing exposure through inhalation, ingestion, and dermal contact. Excavation of drainage ditch sediments will also reduce aquatic toxicity and bioconcentration of mirex and kepone through exposure to contaminated sediment to both aquatic and terrestrial populations.

Implementation of the selected remedy will not pose any unacceptable short-term risks or cross-media impacts to the Site or the community.

11.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with all applicable or relevant and appropriate chemical-specific, location-specific and action-specific ARARs. Those ARARs are:

Chemical-Specific ARARs

The selected remedy will be designed to achieve compliance with chemical-specific ARARs related to groundwater and ambient air quality at the Site. The contaminants from the Centre County Kepone Site and their respective MCLs which are listed under the performance standards of Section 10.1 of this ROD are relevant and appropriate for this remedial action. If a non-zero Maximum Contaminant Level Goal ("MCLG") has been established, the MCLG shall be attained by the remedy.

The Commonwealth of Pennsylvania standards specify that all groundwater containing hazardous substances must be remediated to "background" quality as set forth in 25 PA Code §§ 264.90 264.100, and in particular, 25 PA Code §§ 264.97(i), (j), and 264.100(a) (9). The requirement that all groundwater be remediated to background levels is an ARAR if background levels are determined to be more stringent than the appropriate MCLs or non-zero MCLGs. The method(s) by which background levels will be determined are set forth under the description of the selected remedial alternative contained in Section 10. These background levels, if more stringent than the appropriate MCLs or non-zero MCLGs, shall be attained as part of the remedial action. However, if EPA and the Commonwealth of Pennsylvania determine that attaining such levels is technically impracticable, EPA may amend the ROD or issue and Explanation of Significant Differences to address this situation.

Location-Specific ARARs

The Pennsylvania Erosion Control Regulations, 25 PA Code §§ 102.1 - 102. 5, 102.11 - 102.13, and 102.21 - 102.24, regulate erosion and sedimentation control. These regulations are applicable to the regrading and excavation activities associated with the selected remedial alternative.

The Dam Safety and Waterway Management Act, 25 PA Code §§ 105.1 - 105.3, 105.12, and 105.19 are location-specific regulations for the freshwater drainage ditch as it is considered a water of the Commonwealth.

40 CFR § 6.302 (a), (b), and (g) addressing wetlands, floodplain, and fish and wildlife apply to the groundwater, freshwater drainage ditch, and Thornton Spring selected remedial alternatives.

Action-Specific ARARs

Any surface water discharge of treated effluent will comply with the substantive requirements of the NPDES discharge regulations set forth in 25 PA Code §§ 92.1 and 92.31, the applicable Pennsylvania Water Quality Standards set forth in 25 PA Code Chapter 93, and the Pennsylvania Water Treatment Regulations (25 PA Code §§ 95.1 - 95.3 and 97).

VOC emissions from any air stripping tower will be governed by the PADER air pollution regulations. Air Emissions will also comply with 40 C.F.R. §§ 264.1030 - 264.1034 (Air Emission Standards for Process Vents), and with 40 C.F.R. §§ 264.1050 - 264.1063 (Air Emissions Standards for Equipment Leaks). Air emissions of Vinyl Chloride will comply with 40 C.F.R. Parts 61.60 - 61.69, National Emission Standards for Hazardous Air Pollutants (NESHAPS).

Air permitting and emissions ARARs are outlined in 25 PA Code §§ 121 1 - 121.3, 121.7, 123.1, 123.2, 123.31, 123.41, 127.1, 127.11, 127.12, and 131.1 - 131.4. 25 PA Code § 127.12 requires all new air emission sources to achieve minimum attainable emissions using the best available technology ("BAT"). In addition, the PADER air permitting guidelines for remediation projects require all air stripping and vapor extraction units to include emission control equipment. However, the permitting regulations allow for exemptions if a source is considered to be of "minor significance," or if emission controls are not economically or technically feasible. During design of the air stripping unit, PADER shall determine from actual design flow rates and VOC loading rates whether emission controls need to be installed.

The groundwater collection and treatment operations will constitute treatment of hazardous waste (i.e., the groundwater containing hazardous waste), and will result in the generation of hazardous wastes derived from the treatment of the contaminated groundwater (i.e. spent carbon filters and filter bags). Treatment of groundwater will be implemented consistently with the requirements of 25 PA Code §§ 262.11 - 262.13 (relating to hazardous waste determination and identification numbers), and 25 PA Code § 262.34 (relating to pretransport requirements).

Fugitive dust emissions generated during remedial activities will be controlled in order to comply with fugitive dust regulations in the federally-approved State Implementation Plan ("SIP") for the Commonwealth of Pennsylvania, 25 PA Code §§ 123.1 - 123.2. 25 PA Code §§ 123.31 and 123.41 which prohibits malodors detectable beyond the Ruetgers-Nease Corporation property line is applicable to the selected remedial alternative.

25 PA Code §§ 264.90 - 264.100 (Subchapter F), regarding groundwater monitoring is applicable to the selected remedial alternative.

25 PA Code §§ 16.23, 16.101, 16.102, and Appendix A (Tables 1 and 2), Water Quality Toxics Strategy, will apply for water quality guidance at Thornton Spring and the freshwater drainage ditch.

Since residuals will be generated in the solids filtration portion of the treatment system and the spent GAC carbon filters and contaminants will exist in the excavated soil and sediments, these will first be tested to determine if kepone levels are above the health-based risk concentration of 160 ppb. If kepone concentrations are below 160 ppb, these will be tested to determine if they are RCRA characteristic wastes in accordance with 40 C.F.R. § 261.24 by the Toxic Characteristic Leaching Procedure ("TCLP"). If any of these are determined to be hazardous waste or if kepone concentrations are above 160 ppb, the remedy will be implemented consistent with the substantive requirements, which are relevant and appropriate, of PA Code §§ 262.11 - 262.13 (relating to hazardous waste determination and identification numbers), 25 PA Code § 262.34 (relating to pretransport requirements); and if prohibited by land disposal restrictions, 40 CFR §§ 268.1 - 268.6, 268.8 - 268.9, 268.30 - 268.37, and 268.40 - 268.43. EPA does not presently have sufficient information to determine whether the constituents are hazardous wastes; however, as noted above, EPA shall require the performance of kepone and TCLP testing to address this and 40 CFR § 268.50 (prohibitions on storage of hazardous waste) which are relevant and appropriate to this action. Waste "residuals" generated from the solids filtration portion of the treatment system and the spent GAC carbon filters that are TCLP characteristic wastes will be considered as hazardous waste and will be treated and/or disposed in compliance with the applicable regulations.

Modifications to the onsite storm water drainage system will be required to meet the requirements under Pennsylvania's Storm Water Management Act, 32 P.S. §§ 680.1 - 680.5, and § 680.13, and 25 PA Code 111.14 (Scope of Study).

To Be Considered ("TBC") Standards

Pennsylvania's Ground Water Quality Protection Strategy, dated February 1992 and EPA's Ground Water Protection Strategy, dated July 1991 are TBCs.

Existing pumping and monitoring wells which serve no useful purpose will be properly plugged and abandoned consistent with PADER's Public Water Supply Manual, Part II, Section 3.3.5.11.

OWSER Directive #9355.0-28, Control of Air Emissions from Superfund Air Strippers at Superfund Ground Water Sites, is a "to be considered" (TBC) requirement.

The PADER document entitled "Cleanup Standards for Contaminated Soils", dated December 1993, is a TBC requirement that establishes soil cleanup standards deemed to be acceptable under the residual waste regulations.

Sediment and erosion controls and temporary covers will be installed to protect exposed soil from the effects of weather in accordance with PADER, Bureau of Soil and Water Conservation's Erosion and Sediment Pollution Control Manual.

11.3 Cost-Effectiveness

The selected remedy for OU1 is cost-effective in providing overall protection in proportion to cost, and meets all other requirements of CERCLA. Section 300.430(f) (ii) (D) of the NCP requires EPA to evaluate cost-effectiveness by comparing all the alternatives which meet the threshold criteria - protection of human health and the environment and compliance with ARARs - against three additional balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness. The selected remedy meets these criteria and provides for overall effectiveness in proportion to its cost. The combined estimated present worth cost for the selected remedy is $15,863,000. Detailed capital and O&M cost estimates for the alternatives included in the selected remedy are shown in Tables 11A through 11E.

11.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized while providing the best balance among the other evaluation criteria. Of those alternatives evaluated that are protective of human health and the environment and meet ARARs, the selected remedy provides the best balance of tradeoffs in terms of long-term and short-term effectiveness and permanence, cost, implementability, reduction in toxicity, mobility, or volume through treatment, State and community acceptance, and preference for treatment as a principal element.

Under the selected remedy, groundwater extraction through source and migration control wells and treatment of groundwater using GAC (GW/TS-3) is more cost-effective than the other alternatives evaluated. In addition, the area of attainment is increased under this alternative. Alternative GW/TS-3 will reduce contaminant levels in the Class I aquifer, a special source of groundwater, and reduce the risks associated with direct contact and ingestion of the groundwater to the maximum extent practicable, as well as provide long-term effectiveness.

The selection of SS-2, excavation and offsite disposal of contaminated soils, is consistent with Superfund program policy. The remedy provides the highest degree of long-term effectiveness and permanence, reduces mobility and reduces risk to human health and the environment.

Source control measures for the Site surface water (FWDD/SW-2A) provides the highest degree of long-term effectiveness among the alternatives considered and it is cost-effective. Alternative FWDD/SW-2A will eliminate groundwater infiltration into the surface water drainage system and provide engineering controls to reduce the potential for any inadvertent releases of hazardous substances from entering the freshwater drainage ditch.

Excavation and offsite disposal of contaminated sediments (FWDD/SED-2) is consistent with Superfund program policy. The remedy provides the highest degree of long-term effectiveness and permanence, reduces mobility and reduces risk to human health and the environment.

Institutional controls and monitoring of Spring Creek (SC-2) provides the best balance of trade-offs in terms of long-term effectiveness and permanence, short-term effectiveness, and implementability to support lifting the fishing advisory on Spring Creek. It is also more cost effective than the other alternatives since it is unknown what the combined effects will be from implementing the other alternatives selected in this ROD.

11.5 Preference for Treatment as a Principal Element

The selected remedy satisfies, in part, the statutory preference for treatment as a principal element. The contaminated groundwater alternative addresses the primary threat of future direct contact, inhalation, and ingestion of contaminated groundwater through treatment using a GAC system. If required, the treatment of soil/sediments that pose principal threats to human health or the environment will satisfy the statutory preference for treatment as a principal element.

12.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Revised Proposed Plan for the Centre County Kepone Site was released for public comment on January 27,

1995. EPA reviewed all written and verbal comments submitted during the public comment periods on the original and revised proposed plans. The following changes have been made to the Selected Remedies from the preferred alternative described in the Revised Proposed Plan.

1. The selected alternatives for subsurface soils and sediments at the Site identify kepone as an origin RCRA listed waste (U142) at concentrations above the health-based risk concentration of 160 ppb. Soils and sediments with concentrations above that level destined for offsite disposal will be subject to the LDR treatment standard of 0.13 mg/kg total.

2. The disposition of contaminated soils and sediments, even if treatment is necessary, has been clarified to be a "RCRA permitted subtitle C hazardous waste landfill" rather than a "permitted treatment, storage, and disposal (TSD) facility".

3. The selected alternative for remediation of subsurface soils at the Site has been clarified to indicate that a surficial and deep soil sampling program be performed in the Tank Farm/Building #1 Area. This area was not fully characterized during the RI/FS due to the presence of storage tanks which have since been removed. In addition, construction of a rail tank car loading/unloading facility is planned for the area. The purpose of the sampling program will be to fully characterize the soils and assess the need for additional excavation. The cost of remediation for this area was not factored in the FS cost estimate. However, the size of the area is approximately 500 feet by 200 feet. This change was made in response to several comments received by the Agency.

4. The selected remedial alternative for remediation of freshwater drainage ditch sediments has been clarified to include all of Section A of the drainage ditch and not be limited to the upper forked portion. The cost estimate in the ROD reflects remediation of only the upper forked portion. The cost of remediation for the lower portion of the drainage ditch is estimated at $120,000 (an additional 260 cubic yards). This change was made in response to several comments received by the Agency.

5. The Proposed Plan included a 10 ppb cleanup standard for mirex and kepone for protection of environmental receptors in the onsite freshwater drainage ditch sediments and soils. Since there are analytical concerns regarding the ability to assess this low level of contamination, EPA has included a standard of performance which is equivalent to the 10 ppb cleanup standard. This performance standard will require the upper 24 inches of sediment/soil be removed from the freshwater drainage ditch (regardless of kepone and mirex concentrations). This change was made in response to comments received by the Agency.

6. The Proposed Plan addressed EPA's intention to divide the Site into two operable units (OUs). OU1 will remediate the groundwater, surface water, sediment and soils at the Site (excluding the 15-acre former spray field area) OU2 will address the spray field area and the riparian-areas of Spring Creek. It has become apparent to the Agency that the terminology contained in the Environmental Risk Assessment could be interpreted to exclude the Former Drum Staging Area from OU1. Based on comments received by the Agency, the Former Drum Staging area will be remediated as part of OU1.

APPENDIX A - FIGURES

<IMG SRC 0395195>
<IMG SRC 0395195A>
<IMG SRC 0395195B>
<IMG SRC 0395195C>
<IMG SRC 0395195D>
<IMG SRC 0395195E>
<IMG SRC 0395195F>
<IMG SRC 0395195G>
<IMG SRC 0395195H>
<IMG SRC 0395195I>
<IMG SRC 0305195J>
<IMG SRC 0395195K>
<IMG SRC 0395195L>
<IMG SRC 0395195M>

APPENDIX B - TABLES

TABLE 1

Summary of Ground Water Sampling Results at the Ruetgers-Nease Site State College, PA1

	Detection Frequency		Range of Reported Detection Limit		
Chemical	Number of Detects	Number of Samples	Minimum	Maximum	
VOLATILE ORGANIC COMPOUNDS					
Acetone	9	39	10	10	3
Benzene	16	39	5	10	1
2-Butanone	1	24	10	10	28
Chlorobenzene	5	38	5	10	2
Chloroform	3	39	5	10	
1,1-Dichloroethane	5	39	5	10	
1,2-Dichloroethane	2	39	5	10	3
1,1-Dichloroethene	2	40	5	10	2
1,2-Dichloroethane(total)	17	39	5	10	
Ethylbenzene	13	39	5	10	1
2-Hexanone	1	39	10	10	3
Methylene Chloride	5	39	10	10	
1,1,2,2,-Tetrachloroethane	13	39	5	10	
Tetrachloroethene	13	39	5	10	
Toluene	17	39	5	10	1
1,1,2-Trichloroethane	2	39	5	10	
1,1,1-Trichloroethane	6	39	5	10	
Trichloroethene	20	39	5	10	11.6

TABLE 1 (continued)

Summary of Ground Water Sampling Results
at the Ruetgers-Nease Site
State College, PA[1]

	Detection Frequency		Range of Reported Detection Limits (:g/L)		
Chemical	Number of Detects	Number of Samples	Minimum	Maximum	
Vinyl Chloride	11	39	10	10	1
Xylenes	17	39	5	10	1
PESTICIDES					
Kepone	7	31	0.1	0.132	0.0904
Mirex	10	33	0.00544	0.02	0.0015
			0.145		

1 All sampling results obtained from RI (SMC 1992).

Note: The analytical procedure used for mirex/photomirex/kepone analysis is a represents the best available technology for the quantitative analysis of these compounds. The method adjusts for the recovery obtained o EPA procedure for mirex and kepone (Method 8080) is simply a GC method and does not correct for recovery. Results from the GC-M average, be 20 to 25% higher than results from the EPA GC method.

TABLE 2

Summary of Surface Water Sam
at the Ruetgers-Nease
State College, PA

	Detection Frequency			De	
Chemical	Number of Detects	Number of Samples	Minimum		Maximum
VOLATILE ORGANIC COMPOUNDS					
Acetone	2	12		10	
Benzene	5	12		5	
Chlorobenzene	5	12		5	
Chloroform	1	6		10	
1,2 trans-Dichloroethene	1	6		5	
1,2-Dichloroethene (total)	3	6		10	
Ethylbenzene	4	12		5	
4-Methyl-2-Pentanone	1	6		10	
1,1,2,2-Tetrachloroethane	6	12		5	
Tetrachloroethene	2	12		5	
Toluene	6	12		5	
1,1,2-Trichloroethane	3	6		10	
Trichloroethene	4	12		5	
Vinyl Chloride	4	12		10	
Xylenes	5	12		5	
PESTICIDES					
Kepone	2	9	0.132	0.132	0.818

TABLE 2 (continued)

Summary of Surface Water Sampling Res
at the Ruetgers-Nease Site
State College, PA1

Chemical	Detection Frequency Number of Detects	Number of Samples	Range of Repor Detection Limits (:g/L Minimum	Maximum	
Mirex	5	9	0.0054	0.0054	0

1 All sampling results obtained from RI (SMC 1992).

Note: The analytical procedure used for mirex/photomirex/kepone analysis is a represents the best available technology for the quanitative analysis of these compounds. The method adjusts for the recovery obtained o EPA procedure for mirex and kepone (Method 8080) is simply a GC method and does correct for recovery. Results from the GC-MS is average, be 20 to 25% higher than results from the EPA GC method.

TABLE 3

Summary of Sediment Sampling
at the Ruetgers-Nease Si
State College, PA1

Chemical	Detection Frequency		Range of Reported D Concentrations (:g/kg)		
	Number of Detects	Number of Samples	Minimum	Maximum	
VOLATILE ORGANIC COMPOUNDS					
Acetone	2	15	10	10	110
2-Butanone	1	15	10	10	
Carbon Disulfide	1	10	5	5	
Chlorobenzene	1	15	5	10	
Chloroform	1	10	5	10	
1,2-trans-Dichloroethene	1	10	5	5	
Ethylbenzene	1	15	5	10	
1,1,2,2-Tetrachloroethane	1	10	5	5	
Tetrachloroethene	2	16	5	10	
Toluene	7	15	5	10	1
1,1,2-Trichloroethane	1	10	5	5	
Trichloroethene	1	10	5	5	67
Vinyl Chloride	1	10	10	10	
Xylenes	4	15	5	10	4
PESTICIDES					
Kepone	7	16	35.6	68	8
Mirex	13	16	6.5	18.5	

TABLE 3

Summary of Sediment Sampl
at the Ruetgers-Nease Si
State College, PA1

Chemical	Detection Frequency: Number of Detects	Detection Frequency: Number of Samples	Detected Concentrations (:g/kg): Minimum	Detected Concentrations (:g/kg): Maximum

1 All sampling results obtained from (SMC 1992).

Note: The analytical procedure used for mirex/photomirex/kepone analysis is a represents the best available technology for the quantitative analysis of these compounds. The method adjusts for the recovery obtained EPA procedure for mirex and kepone (Method 8080) is simply a GC method and does not correct for recovery. Results from the GC-average, be 20 to 25% higher thatn results from the EPA GC method.

TABLE 4

Summary of Surface Soil Sampling
at the Ruetgers-Nease Site
State College, PA1

Chemical	Detection Frequency: Number of Detects	Number of Samples	Range of Reported Detection Limits (:g/kg): Minimum	Maximum	
VOLATILE ORGANIC COMPOUNDS					
Methylene Chloride	2	6	5	10	7
1,1,2,2-Tetrachloroethane	1	2	5	5	6
Tetrachloroethene	1	4	10	10	
Toluene	2	4	10	10	2
Trichlorethene	2	6	5	10	
PESTICIDES					
Kepone	7	9	68	68	23
Mirex	9	9	18.5	18.5	32

1 All sampling results obtained from RI (SMC 1992).

Note: The analytical procedure used for mirex/photomirex/kepone analysis is a represents the best available technology for the quantitative analysis of these compounds. The method adjusts for the recovery obtai EPA procedure for mirex and kepone (Method 8080) is simply a GC method and does not correct for recovery. Results from the average, be 20 to 25% higher thatn results from the EPA GC method.

TABLE 5

Summary of Deep Soil Sampling Results
at the Ruetgers-Nease Site
State College, PA1

	Detection Frequency		Ran Detect		
Chemical	Number of Detects	Number of Samples	Minimum	Maximum	
VOLATILE ORGANIC COMPOUNDS					
Acetone	9	31	10		
Benzene	3	15	5		
2-Butanone	4	34	10		
Carbon Disulfide	4	29	5		
Chlorobenzene	5	32	5		
Chloroform	2	14	5		
1,2-Dichloroethene (total)	9	34	5		
1,2-Dichloropropane	1	16	5		
Ethylbenzene	13	34	5		
1,1,2,2-Tetrachloroethane	22	32	5		
Tetrachoroethene	15	32	5		
Tetrahydrofuran	1	19	5	5	810
Toluene	14	34	5		
1,1,2-Trichoroethane	3	30	5		
Trichloroethene	24	34	5		
Vinyl Chloride	1	14	10		
Xylenes	18	34	5		

TABLE 5 (continued)

Summary of Deep Soil Sampling Results
at the Ruetgers-Nease Site
State Colloge, PA1

Chemical	Detection Frequency: Number of Detects	Detection Frequency: Number of Samples	Range of Detection: Minimum	Range of Detection: Maximum	
PESTICIDES					
Keypone	12	34	68	68	5.52
Mirex	29	34	18.5	18.5	0.63

1 All sampling results obtained from RI (SMC 1992).

Note: The analytical procedure used for mirex/photomirex/kepone analysis is a represents the best available technology for the quantitative analysis of these compounds. The method adjust for the recovery obtain EPA procedure for mirex and kepone (Method 8080) is simply a GC method and does not correct for recovery. Results from the average, be 20 to 25% higher thatn results from the EPA GC method.

```
                                                                         TABLE 6

                                                        Summary of Media-Speific
                                                                 at the Ruetgers
                                                State College, PA

                                                Sediment
                                         Ground Water
                   Chemical            Air              Creek    Ditch    Spring
Fish

  1.  Acetone           X    X        X         X              X
  2.  Benzene           X    X                     X                  X
  3   2-Butanone        X    X        X                  X
  4.  Carbon Disulfide                           X       X
  5.  Chlorobenzene        X    X            X              X
  6.  Chloroform             X            X              X
  7.  1,2-Dichlorobenzene     X
  8.  1,1-Dichloroethane           X
  9.  1,2-Dichloroethane           X
  10. 1,1-Dichloroethene           X
  11. 1,2-Dichloroethene      X    X                X       X
  12. 1,2-Dichloropropane                             X
  13. Ethylbenzene         X    X                     X
  14. 2-Hexanone             X
  15. Kepone                 X        X         X         X       X
X
  16. Methylene Chloride           X                         X
  17. 4-Methyl-2-Pentanone                                          X
  18. Mirex               X        X         X     X        X        X
X
  19. 1,1,2,2,-Tetrachlorethane     X    X                  X        X
  20. Tetrachloroethene            X           X     X        X               X
X
```

TABLE 6 (Continued)

Summary of Media-Specific Chemical Dete
at the Ruetgers-Nease Site
State College, PA

```
                                   Sediment
                  Ground Water                             Surface Soils
      Chemical            Air            Creek   Ditch     Spring      Deep So

21.  Tetrahydrofuran                                           X
22.  Toluene        X    X        X       X      X      X           X
23.  1,2,4-Trichlorobeneze   X
24.  1,1,1-Trichloroethane   X    X
25.  1,1,1-Trichloroethane        X                    X      X
26.  Trichloroethene      X         X               X      X     X
27.  Trichlorofluoromethane  X
28.  Vinyl Chloride       X    X              X      X
29.  Xylenes        X    X          X      X      X             X
```

TABLE 7

Potential Exposure Pathways
Ruetgers-Nease State Colleg

Potentially Exposed Population

```
                                                                             Worker
    Exposure Medium/             Floodplain          Off-site
     Exposure Route            Resident           Resident        Episodic1  Da

  Ground Water
      Ingestion                  x3                              x
      Dermal Contact             x3                              x
      Inhalation of Vapors          x3                             x
  Surface Water
       Incidental Ingestion            x              x       x
       Dermal Contact               x              x       x
  Sediment
      Incidental Ingestion          x              x       x
      Dermal Contact             x              x       x
  Soil
     Incidental Ingestion      x4                x    x      x
     Dermal Contact         x              x    x      x           x
  Air
     Vapor                  x5
  Food
      Ingestion of Beef        x
      Ingestion of Fish                                    x6
```

1 An on-site episodic worker is assumed to be exposed to deep subsurface soi activities.
An on-site daily worker is assumed to contact surficial soils while perfor
2 A trespasser is assumed to be exposed to chemicals in soil, surface water,
3 An off-site resident is assumed to be exposed to ground water under a futu
4 Exposure to floodplain soils will be assumed using concentrations in Thorn
5 An off-site resident is assumed to be exposed to vapors volatilizing from
6 There is a current ban on keeping fish caught in Spring Creek; the future lifted.

TABLE 8
Summary of Centre County Kepone Site
Risk Scenarios and Estimates

Population	Cancer Risk/ Hazard Index	Media Analyzed	Contaminants[1] with Significant Risk	E
Current Offsite	2 x 10-6	Surface Water		
Resident	HI = 0.07	Sediment		
		Air		
Current Offsite	1 x 10-6	Sediment*		
Floodplain Resident	HI = 0.06	Beef		
Current Onsite	5 x 10-7	Subsurface		
Worker (episodic)	HI = 0.4	Soil		
Current Onsite	1 x 10-6	Surface Soil*		
Worker (daily)	HI =0.04			
Current Trespasser	9 x 10-8	Surface Water		
	HI = 0.02	Sediment		
		Soil		
Current Recreational	7 x 10-8	Surface Water		
Visitor	HI = 0.0003	Sediment		
Future Offsite	2 x 10-3	Groundwater*	Benzene	
Resident	HI = 5	Surface Water	Dichloroet	
		Sediment	Tetrachlor	
		Air	Tetrachlor	
			Trichloroe	
			Vinyl chlo	
Future Recreational	4 x 10-5	Surface Water	Mirex	
Visitor	HI = 1	Sediment		
		Fish*		
Future Onsite	1 x 10-2	Groundwater*	Benzene	
Resident	HI = 1100	Soil*	Dichloroet	
			Ethylbenze	
			Tetrachlor	
			Tetrachlor	
			Toluene	
			Trichloroe	
			Vinyl chlo	
			Xylenes (m	
			Mirex	

Notes:
1 - Only those contaminants exceeding a 1 x 10-6 cancer risk or HI = 1 are lis
* - Media and exposure routes which exceeded a 1 x 10-6 cancer risk or HI = 1

TABLE 9

Soil and Sediment Clean-up Levels
for the Centre County Kepone Site

Chemical	Allowable Concentrations in Soils and Sediments(1) (:g/kg)
1. Acetone	463
2. Benzene	25
3. 2-Butanone	473
4. Carbon Disulfide	13,003
5. Chlorobenzene	1,984
6. Chloroform	264
7. 1,2-Dichloroethene	210
8. 1,2-Dichloropropane	15
9. Ethylbenzene	46,287
10. Kepone	72,737
11. Methylene Chloride	200(2)
12. Mirex	33,062
13. 1,1,2,2-Tetrachloroethane	14
14. Tetrachloroethene	109
15. Tetrahydrofuran	70(2)
16. Toluene	15,028
17. 1,1,2-Trichloroethane	17
18. Trichloroethene	38
19. Vinyl Chloride	1
20. Xylenes	161,104

Notes:
(1) - Summers Model calculations for subsurface soils with foc = 4% and natur
cover as contained in the Feasibility Study dated October 1993.
(2) - Level 2 protection standards taken from "PA Guidance for Cleanup Standa
for Contaminated Soils dated December 1993".

TABLE 10

REMEDIAL ALTERNATIVE ESTIMATED COSTS

Alternative Alternative Title T
Designation Capital Cost
Worth1

Remediation of Groundwater and Thornton Spring

GW/TS-1 No Action
GW/TS-2 No Further Action
GW/TS-3 Groundwater Source and Migration Control
$9,052,000
GW/TS-4 Groundwater Source Control and Thornton Spring In-Situ Treatment
$831,6802 $14,926,000

Remediation of Subsurface Soils

SS-1 No Further Action
SS-2 Excavation
SS-3 Soil Vapor Extraction
SS-4 Capping

Remediation of FWDD Surface Water

FWDD/SW-1 No Action
FWDD/SW-2A Source Control - Reconstruct Existing Pipes
$1,550,000
FWDD/SW-2B Source Control - Plug Existing Pipes & Replace with Aboveground Pip
$55,500 $1,233,000

Remediation of FWDD Sediments

FWDD/SED-1 No Further Action
FWDD/SED-2 Excavation and Soil Lined Ditch
$536,000
FWDD/SED-3 Concrete Lined Ditch with Excavation
$454,000

Remediation of Spring Creek Sediments

SC-1 No Action
SC-2 Institutional Controls and Monitoring
SC-3 Hydraulic/Vacuum Dredging
$20,001,000
SC-4 Line Stream Channel

Notes:
1 - Present worth was calculated using a seven (7) percent discount rate over
2 - Excludes monitoring costs for years 1 and 2 totaling $266,400.

TABLE 11A
Cost Estimate
For Remedial Alternativ
GW/TS-3: Groundwater Source and Migration Cont

Activity	Unit Costs	Units
ESTIMATED DIRECT CAPITAL COSTS		
Mobilization/Demobilization	$75,000	Lump sum
Groundwater Extraction:		
-Wells:		
-8"-dia., 150' deep	$14,000	per well
-8"-dia., 300' deep	$28,000	per well
-12"-dia., 85' deep	$10,000	per well
-hydrofracturing 10 wells	$85,000	Lump sum
experience		
-Pumps (4", 1/3 Hp)	$450	each
-Pumps (4", 1/2 Hp)	$500	each
-Pumps (4", 3/4 Hp)	$550	each
-Pumps (4", 1 Hp)	$600	each
-Housing	$2,000	each
-Instrumentation	$1,500	each
-Piping, lift		
*1.25" ID Sch. 40 Carbon Steel	$3	FT
Coll		
*1.0" ID Sch. 40 Carbon Steel	$2	FT
Coll		
-Piping, transmission system		
* 4" SDR-17/8" SDR-17 Plexco HDPE	$20	FT
McElvenny, Exton		
-Trench, backfill, compact	$10	FT
-Pump Installation	$700	each
-Electrical supply, control wiring, and conduit	$6	FT
-Install electrical/mechanical/controls	$100,000	Lump sum
Subtotal		
Fencing (Access Restriction)	$20	FT
Deed Restrictions	$10,000	Lump sum
Subtotal		

TABLE 11A (continued)

Cost Estimate
For Remedial Alternative
GW/TS-3: Groundwater Source and Migration

Activity	Unit Costs	Units	Qua Cost		
Groundwater Treatment System Upgrade to 250 gpm capacity with air treatment					
-air stripping tower	$45,000	each	2	$90,000	Car
-GAC Column (10000 lbs carbon water cells)	$110,000	each	2		
-Carbon (Water), first charge	$2	per lb.	20000		
-GAC column (Air vessels/blowers/condensers)	$32,000	each			
-Carbon (Air), first charge	$2.50	per lb.	6000		
-bag filters	$1,500	each	6	$9,000	
-pipes, valves, fittings, pretreatment	$40,000	Lump sum	1		
-electrical and instrumentation	$150,000	Lump sum			
-pumps	$5,000	each	2	$10,000	
-equalization tank (20,000 gal)	$25,000	Lump sum	1		
-Oil Skimmer for Equalization Tank	$5,000	each	1		
-installation	$100,000	Lump sum	1	$	
-Facility building	$40	sq. ft.	2000		
	Subtotal		$848,000		
	$1,858,150				
TOTAL DIRECT CAPITAL COST					
ESTIMATED INDIRECT CAPITAL COSTS					
Gen. Engineering Services (15%)	Lump sum	$278,723			
Permitting/Regulatory Coordination (5%)	Lump sum	$92,908			
Implement Health & Safety Plan (5%)	Lump sum	$92,908			
Contingency (20%)	Lump sum	$371,630			
TOTAL INDIRECT CAPITAL COSTS	$2,694,318				
TOTAL CAPITAL COSTS					

TABLE 11A (continued)

Cost Estimate
For Remedial Alter
QW/TS-3: Groundwater Source an

Activity	Unit Costs	Units	Quant		
O & M COSTS					
Groundwater Extraction & Treatment					
Operation Cost					
-Operation Labor	$40	man hour	4160	$166,400	
-Maintenance & Repair	$30,000	year	1	$30,000	
-Electrical Power	$45,000	year	1	$45,000	
-Chemical Cost	$15,000	year	1	$15,000	
-Carbon Replacement (water)	$0.60	per lb.	40000		
-Carbon Replacement (air)	$0.80	per lb.	24000		
-Transportation for carbon	$0.15	per lb.	64000		
-Sludge Disposal	$20,000	year	1	$20,000	
Subtotal Annual Operating Cost				$329,200	
Ground Monitoring					
(Quarterly - years 1 to 2)					
analytical cost - VOCs	$350	per sample	132	$46,200	
analytical cost - Mirex, Kepone, and Photomirex	$1,100	per sample	132	$145,200	sam 1
Sample Collection - Labor	$70	man hour	260	$18,200	
Sample Collection - expenses	$1,500	Lump sum	8		sample
Reporting	$5,600	each	8	$44,800	f event
Total Monitoring Costs Years 1 - 2				$266,400	

TABLE 11A (co
Cost Esti
For Remedial Alt
GW/TS-3: Groundwater Sourc

Activity	Unit Costs	Units	Qua
Groundwater Monitoring (Semiannual - years 3 through 30)			
analytical cost - VOCs	$350	per sample	
analytical cost - Mirex, Kepone, and Photomirex	$1,100	per sample	
Sample Collection - Labor	$70	man hour	
Sample Collection - expenses	$1,500	Lump sum	
Reporting	$5,600	each	
Annual Monitoring Costs			
Treatment System Monitoring			
analytical cost - VOCs	$350	per sample	
analytlcal cost - Mirex, Kepone, and Photomirex	$1,100	per sample	
Sample Collection - Labor	$70	man hour	
Reporting	$2,000	each	
Annual Treatment System Monitoring Costs			
Fence Maintenance	$1,500	per year	
Subtotal			
Annual Data Review and Report	$10,000	per year	
Subtotal			

TABLE 11A (continued)

Cost Estimate

Cost Estimate

For Remedial Alternative

GW/TS-3: Groundwater Source and Migration Control

Activity	Unit Costs	Units	Quantity
Five Year Data Review and Report	$12,450	each	
Annual Subtotal		$2,490	
TOTAL ANNUAL O & M COST (excluding years 1 and 2)	$490,870		
PRESENT WORTH (30 YEARS @ 7%)		$6,091,206	
Total Monitoring Costs Years 1-2	$266,400		
Subtotal	$6,357,606		
PRESENT WORTH ALTERNATIVE GW/TS-3			
Capital Cost	$2,694,318		
O & M Cost (Present Worth)	$6,357,606		
TOTAL PRESENT WORTH FOR ALTERNATIVE GW/TS-3			$9,0

TABLE 11B

Cost Estimate
For Remedial Alternative
SS-2: Excavation

Activity	Unit Costs	Units	Quantity
	Cost		Estimate
ESTIMATED DIRECT CAPITAL COSTS			
EXCAVATION/REMOVAL			
Mob/Demob	$50,000	Lump sum	1
Conventional Excavation	$30	C.Y.	6000
Data			
Shoring for excavations	$15	SF	1500
Off-site disposal	$240	ton	9720
Imported clean backfill	$20	C.Y.	6000
022-266-0550)			
Place/compact backfill	$15	C.Y.	6000
Fine grading	$5,000	acre	2
Pavement Replacement	$40	LF	1000
Laboratory Analytical Services:			
CLP - VOCs, TCLP	$2,000	sample	30
Permanent Fencing (Access Restriction)	$20	LF	2400
Deed Restrictions	$10,000	Lump sum	1
TOTAL DIRECT CAPITAL COST			
ESTIMATED INDIRECT CAPITAL COSTS			
Gen. Engineering Services (15%)		Lump sum	
Permitting/Regulatory Coordination (5%)		Lump sum	
Implement Health & Safety Plan (5%)		Lump sum	
Contingency (20%)		Lump sum	
TOTAL INDIRECT CAPITAL COSTS			
TOTAL CAPITAL COSTS			

TABLE 11B (continued)

Cost Estimate
For Remedial Alternative
SS-2 Excavation

Activity	Unit Costs	Uni
O & M COSTS		
Annual Fence Maintenance	$1,500	Year
TOTAL ANNUAL O & M COST		
PRESENT WORTH (30 YEARS @ 7%)		
PRESENT WORTH ALTERNATIVE SS-2		
Capital Cost		
O & M Cost (Present Worth)		
TOTAL PRESENT WORTH FOR ALTERNATIVE SS-2		

TABLE 11C

Cost Estimate
For Remedial Altern
FWDD/SW-2A: Source Control - Exca

Activity	Unit Costs	Units	Quant Cost
ESTIMATED DIRECT CAPITAL COSTS			
Mobilization/Demobilization	$10,000	Lump sum	
Conventional Excavation	$30	CY	
Off-site disposal	$240	Ton	
Imported clean backfill	$20	CY	
022-266-0550)			
Place/compact backfill	$15	CY	
Bituminous pavement removal	$7	SY	
Pavement off-site disposal	$11	CY	
Patch Pavement(3" wearing & 1.5"	$13	SY	
022-308-0050/8900			
binder course, 3" gravel base)			
Topsoil, lime, fertilizer & seed	$3	SY	
029-304-0310/022-286-0250			
HDPE pipe (12" Dia. Plexco SDR 32.5)	$7	FT	
fusion, tech.)			
Temporary reroute water, HDPE Pipe	$6	FT	
Site Grading	$10,000	Acre	
Secondary contanment structures(concrete)	$5,000	Each	
Plant operation Interference	$30,000	Day	
TOTAL DIRECT CAPITAL COST			
ESTIMATED INDIRECT CAPITAL COSTS			
Gen. Engineering Services (15%)		Lump sum	
Permitting/Regulatory coordination(5%)		Lump sum	
Implement Health & Safety Plan(5%)		Lump sum	
Contingency(25%)		Lump sum	
TOTAL INDIRECT CAPITAL COSTS			
TOTAL CAPITAL COSTS			

TABLE 11C (continued)
Cost Estimate
For Remedial Alternative
FWDD/SW-2A: Source Control - Excavate/Replace Existing

Activity	Unit Costs	Units Cost	Quantity	Esti Estim
O & M COSTS				
Roadway maintenance	$8,000	Year	1	$
Vegetation/lawn Maintenance	$8,500	Year	1	$
Inspection & Reporting	$7,000	Year	1	$
NPDES Surface Water Sampling	$4,000	Month	12	$4
TOTAL ANNUAL O & M COST				$7
PRESENT WORTH(30 YEARS @ 7%)				$8
PRESENT WORTH ALTERNATIVE				
FWDD/SED-2				
Capital Cost				$6
O & M Cost (Present Worth)				$8
TOTAL PRESENT WORTH FOR ALTERNATIVE FWDD/SED-2				$1,5

TABLE 11D

For
FWDD/SED-2:

Activity	Unit Costs	Units
ESTIMATED DIRECT CAPITAL COSTS		
Mobilization/Demobilization	$10,000	Lump sum
Conventional Excavation	$30	CY
Off-site disposal	$240	Ton
Imported clean backfill	$20	CY
Place/compact backfill	$15	CY
6" Topsoil, lime, feritilzer & seed 029-304-0310/022-286-0250	$3.00	SY
Temporary reroute water, HDPE Pipe delivery)	$6.00	FT
Grade channel	$5.00	SY
Lab Services(20 VOCs, TCLP SED Samp)	$2,000	Sample
TOTAL DIRECT CAPITAL COST		
ESTIMATED INDIRECT CAPITAL COSTS		
Gen. Engineering Services (15%)		Lump sum
Permitting/Regulatory Coordination(5%)		Lump sum
Implement Health & Safety Plan(5%)		Lump sum
Contingency(20%)		Lump sum
TOTAL INDIRECT CAPITAL COSTS		
TOTAL CAPITAL COSTS		

TABLE 11D (continued)

Costs Estimate
For Remedial Alternative
FWDD/SED-2: Excavation and Soil

Activity			Units Costs		Units
O & M COSTS					
Inspection & reporting	$6,400	Year	1	$6,400	5 days/
Vegetation/lawn maintenance	$8,500	Year	1	$8,500	26 d
TOTAL ANNUAL O & M COST			$14,900		
	$184,894				
PRESENT WORTH(30 YEARS @ 7%)					
PRESENT WORTH ALTERNATIVE FWDD/SED-2					
Capital Cost					$3
O & M Cost (Present Worth)					
TOTAL PRESENT WORTH FOR ALTERNATIVE FWDD/SED-2					

TA

Cost
For Remedi
SC-2: No Action with Temporary

Activity	Unit Costs Cost	Units	Quantity Estimate	Estima
CAPITAL COSTS				
No Capital Costs				
O & M COSTS				
Laboratory Analytical Services:				
Mirex and Kepone	$1,200	Sample	12	$14
lower trophic and 3 upper				
QA/QC Samples	$1,200	Sample	5	$6
Annual Analytical Services Subtotal				$20
Sample Collection	$4,000	Per Year	1	$4
Reporting of Data	$8,000	Per Year	1	$8
includes data validation.				
Annual O & M Subtotal				$32
Contingency (20%)				$6
TOTAL ANNUAL O & M COST				$38
PRESENT WORTH (30 YEARS @ 7%)				$482
TOTAL PRESENT WORTH FOR ALTERNATIVE SC-2: NO ACTION WITH TEMPORARY INSTITUTIONAL CONTROLS AND MONITORING				$482

NOTES:
QA/QC samples include:
Dupilcates, Field blanks, Matrix Spike, Matrix Spike Duplicate, and Method bla

APPENDIX C - RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
FOR THE PROPOSED REMEDIAL ACTION PLAN
AT THE
CENTRE COUNTY KEPONE SUPERFUND SITE
STATE COLLEGE, PENNSYLVANIA

Public Comment Period:
October 3, 1994 thru December 1, 1994

Note: This Responsiveness Summary plus the attached Responsiveness Summary Supplement which addresses the public comment period from January 27, 1995 thru February 25, 1995 constitute the complete summary of significant comments received from the public on the original and revised Proposed Remedial Action Plan for the Centre County Kepone Site.

CENTRE COUNTY KEPONE SITE

RESPONSIVENESS SUMMARY
FOR THE
PROPOSED REMEDIAL ACTION PLAN

TABLE OF CONTENTS

RESPONSIVENESSS SUMMARY
CENTRE COUNTY KEPONE BITE
STATE COLLEGE, PENNSYLVANIA

This community relations responsiveness summary is divided into the following sections:

Overview: This section discusses EPA's preferred alternative for remedial action.

Background: This section provides a brief history of community interest and concerns raised during remedial planning at the Centre County Kepone Site.

Part I: This section provides a summary of commentors' major issues and concerns, and expressly acknowledges and responds to those raised by the local community. "Local community" may include local homeowners, businesses, the municipality, and potentially responsible parties (PRPs).

Part II: This section provides a comprehensive response to all significant comments and is comprised primarily of the specific legal and technical questions raised during the public comment period. If necessary, this section will provide technical detail to answers responded to in Part I.

Any points of conflict or ambiguity between information provided in Parts I and II of this responsiveness summary will be resolved in favor of the detailed technical and legal presentation contained in Part II.

OVERVIEW

In October 1994, EPA announced the opening of the public comment period and published its preferred alternative for the Centre County Kepone Site, located in State College, Centre County, Pennsylvania. EPA divided the Site into five areas, based on either the location or the media involved:

! Ground water and Thornton Spring surface water;
! Subsurface soils;
! Fresh water drainage ditch (FWDD) surface water;
! FWDD sediments;
! Spring Creek sediments.

For each of the five areas, EPA screened several possible alternatives to remediate the Site contamination, giving consideration to nine key evaluation criteria:

! Threshold criteria, including;
--Overall protection of human health and the environment;
--Compliance with Federal, state, and local environmental and health laws;

! Balancing criteria, including;
--Long-term effectiveness and permanence;
--Reduction of mobility, toxicity, or volume of contaminants;
--Short-term effectiveness;
--Ability to implement;
--Cost; and

! Modifying criteria, including;
--State acceptance; and
--Community acceptance.

EPA carefully considered state and community acceptance of the remedy prior to reaching the final decision regarding the remedy.

The Agency's preferred remedy for each of the five areas is outlined below. A full description can be found in Section V, Evaluation of Alternatives, in the Proposed Plan.

Groundwater and Thornton Spring Surface Water

The preferred alternative is Alternative GW/TS-3. This alternative includes:

- Installing a new or supplemental groundwater source control system;

- Installing a migration control system to restore the contaminated groundwater and surface water to background levels, if technically practical;

- Sampling the onsite groundwater, Thornton Spring surface water, and the treatment system influent and effluent periodically to evaluate the effectiveness of the system;

- Implementing institutional controls for the Site and Thornton Spring;

- Constructing fencing around the Thornton Spring area.

Subsurface Soils

The preferred alternative is Alternative SS-2. The goal of this remediation is to protect potential environmental receptors by removing those soils where the concentrations of volatile organic carbons (VOCs) may contaminate the groundwater. This alternative includes:

- Excavating contaminated soils from the more isolated areas on the Ruetgers-Nease property;

- Disposing of excavated contaminated soils offsite;

- Implementing institutional controls, such as deed restrictions;

- Extending the fencing around the Site.

FWDD Surface Water

The preferred alternative is Alternative FWDD/SW-2A. This alternative includes:

- Implementing source control measures;

- Repairing or replacing the existing underground surface water discharge lines to reduce the potential groundwater infiltration from entering the FWDD surface water.

FWDD Sediments

The preferred alternative is Alternative FWDD/SED-2. This alternative includes:

- Excavating contaminated sediments in the upper forked portion of the FWDD where the concentrations of VOCs in the sediments exceed levels that are protective of groundwater and environmental receptors.

- Disposing of excavated sediments offsite.

Spring Creek Sediments

The preferred interim alternative is Alternative SC-2. This alternative includes:

- ! Monitoring of Spring Creek fish tissue and stream channel sediments for up to 30 years to support canceling the present "catch and release" fishing advisory.

- ! Conducting a phased sampling program for Spring Creek bank area soils.

These alternatives satisfy the key criteria for remedy selection and minimize the need for long-term treatment and management.

BACKGROUND

Community interest and concern about the Site has been steady throughout EPA involvement. EPA and the State conducted an initial public meeting in State College, Pennsylvania on September 11, 1990 to inform residents of the cleanup process and activities which would take place at the Site. On September 6, 1991, a Technical Assistance Grant ("TAG") of $50,000 was issued to a local citizens' group for the purpose of hiring an independent technical consultant to assist the group in understanding and commenting on technical documents for the Site. However, the grant was terminated on August 15, 1992 because the TAG recipient was dissolved. EPA issued a Fact Sheet which provided the results of the Phase I Remedial Investigation and outlined Phase II activities in May of 1992.

To obtain public input on the Proposed Remedial Action Plan (Proposed Plan or PRAP), EPA held a public comment period from October 3, 1994 to December 1, 1994. In addition, EPA held a public meeting on October 19, 1994 at the State College Area High School, State College, Pennsylvania, to discuss issues related to the Proposed Plan. Local area residents, state, county, and local officials, news media representatives, EPA representatives, and representatives from companies interested in the Site activities and clean-up decisions attended the meeting.

EPA issued public notification of the October 19, 1994 meeting to local media, area residents, and Federal, state and local officials on EPA's Site mailing list. EPA also announced the opening of the public comment period in a newspaper display ad placed in the Centre Daily Times.

In addition, EPA established a Site information repository at the Schlow Memorial Library. The repositories contain the community relations plan, the Remedial Investigation/Feasibility Study (RI/FS) report, the Proposed Plan, and other relevant documents. EPA also houses its Administrative Record, encompassing the key documents the Agency uses in selecting the Site remedy, at the Schlow Memorial Library.

PART I: SUMMARY OF COMMENTORS' MAJOR ISSUES AND CONCERNS

This section provides a summary of commentors' major issues and concerns, and expressly acknowledges and responds to those raised by the local community. The major issues and concerns about the proposed remedy for the Centre County Kepone Site received at the public meeting on October 19, 1994, and during the public comment period, can be grouped into four categories:

A. Implementation of the Remedy
B. Air Contamination Issues
C. Health Concerns
D. Miscellaneous

The questions, comments, and responses are summarized below.

A. Implementation of the Remedy

1. A citizen requested clarification of the groundwater treatment process.

   EPA Response: The contaminants in the soil at the Site are leaching into the groundwater and contaminating it. To remediate the groundwater contamination at the Site, EPA must meet two objectives: removing the soil which is causing the groundwater contamination to prevent future contamination; and removing the contaminants that currently exist in the groundwater. The preferred alternative addressing the Subsurface soils area will accomplish the first objective. The soils will be excavated where the VOC concentrations exceed levels that are determined to be protective of groundwater and environmental receptors, and the soils disposed of offsite. The existing groundwater contamination will be addressed through the preferred alternative for the Groundwater and Thornton Spring Surface Water area. Groundwater will be removed through extraction wells, processed in a treatment plant to remove the contaminants, and discharged to the facility's surface water system.

2. A citizen expressed concern that the contaminated soil will be disposed near the Site, on Ruetgers-Nease property.

   EPA Response: The contaminated soil will not be treated or disposed at the Ruetgers Nease facility. An appropriate landfill to accept the contaminated soil will be researched and located during the Remedial Design. The landfill must be a permitted facility which meets the reguirements necessary to handle the contaminants in the soil and may be located anywhere in the United States.

3. A citizen asked what would happen to the buildings on Ruetgers-Nease property while the soil is being excavated.

   EPA Responae: The areas of high contamination include the tank farm/building #1 area, the area east of production building #2, the former spray field, the former drum staging area, and the designated outdoor storage area. The accessible contaminated areas will be excavated. The Proposed Plan provides for excavation of the former spray field, the former drum staging area, and the designated outdoor storage area.

   Because the facility is active, the areas under or near the buildings (the tank farm/building #1 and the production building number #2) will not be excavated. This means that a major source of contamination will remain on the Site. The remedy calls for curbing this contamination source by using migration control wells to prevent the ground water from migrating down to Spring Creek. Should monitoring of the ground water indicate that the remedy is not meeting cleanup objectives, further action addressing the onsite soil may be implemented in the future.

4. A citizen asked whether Route 26 would be moved during the excavation.

   EPA Response: The remedy will not affect Route 26. The amount of contaminated soil under the road is minimal and will not be disturbed as part of the cleanup.

5. A citizen asked how much of the Thornton Spring area would be fenced.

   EPA Response: The exact locations and specifications for the areas to be fenced at Thornton Spring will be decided during the Remedial Design phase of the project.

6. A citizen expressed dismay that the Site, which has existed for 20 years, has taken so long to reach the clean-up stage.

   EPA Response: Congress enacted CERCLA in 1980. The Site was included on the National Priorities List in 1983, when the Superfund program was in its infancy. Congress passed the Superfund Amendments and Reauthorization Act in 1986 which gave the Act additional enforcement capability to aid in the cleanup process. Since the amendments were enacted, the cleanup process has become more uniform. However, even now, it generally takes eight to ten years to clean up a Site. One of the reasons is the wide range of complicated technical issues which must be investigated and addressed.

7. A citizen requested a time frame for the cleanup.

   EPA Response: Once the Record of Decision has been issued, the Remedial Design, or the plan for accomplishing the site cleanup will begin. The Remedial Design could take six months to a year to develop. The Remedial Action, which is the actual cleanup, can begin as soon as the Remedial Design is complete. At this point in time, EPA cannot anticipate how long the Remedial Action will take. Nowever, a schedule for cleanup activities will be developed during the Remedial Design.

B. Air Contamination Issues

1. A citizen asked whether air had been considered as an exposure pathway in the risk assessment.

   EPA Response: (Note that the response provided by EPA at the public meeting was not entirely complete. The response that follows is considered more complete based on further review of the site documents) Yes. Air samples were collected from the Thornton Spring area and EPA used these data to estimate the inhalation exposures of the residents living near Thornton Spring. The current and future risk associated with the inhalation pathway only, based on the air sample data is 6 x 10-7, or six in ten million. This value indicates an acceptable exposure level, given that the NCP states that "...acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10-4 (one in ten thousand) and 10-6 (one in one million)..."

2. The same citizen expressed concern that the threat from air exposure was based on estimated concentrations of the contaminants in the air rather than actual concentrations.

   EPA Response: The threat from air exposure was calculated based on actual air data collected directly from the Thornton Spring area during two sampling events - one fair weather event and one foul weather event in the Summer of 1991. No estimated or modeled concentrations were used to assess the risk to residents from the inhalation of vapors in the vicinity of Thornton Spring. Modeled or estimated air concentrations were only used to assess the risk associated with the inhalation of vapors during showering as part of the offsite resident future groundwater risk evaluation .

3. The same citizen asked whether the concentrations proposed by the model were the same as the actual measured concentrations.

   EPA Response: See previous response, Part I, Section B, Comment #2.

4. The same citizen commented that the air samples from Thornton Spring ranged from 74.3 micrograms per cubic meter to 390.7 micrograms per cubic meter and asked whether 390.7

micrograms per cubic meter could be considered a potential risk.

EPA ResDonse: In order to assess the risk of exposure to chemicals of potential concern, it is necessary to determine the chemical concentrations in the media of concern. Air samples were collected in the Thornton Spring area to determine what chemicals and concentrations were present in the air. Sixteen chemicals of potential concern were detected in the various air samples at a variety of concentrations.

Reasonable maximum exposure (RME) concentrations were developed for each chemical detected, which is the basis for the risk calculations. The RME of each chemical of concern is represented by either the highest observed (detected) concentration or the 95 percent upper confidence limit on the mean concentration (a statistical analysis), whichever is lower. A RME was determined for each of the 16 chemicals detected in the Thornton Spring air samples, and these values were used to calculate the risk associated with the air in the vicinity of the spring. Based on these risk calculations, there is no unacceptable risk associated with air exposure in the vicinity of Thornton Spring.

5. The same citizen asked why risk from air exposure was calculated for offsite residents but not potential future onsite residents.

   EPA Response: EPA calculated air exposure risk for offsite residents because of their proximity to Thornton Spring. Potential future onsite residents are unlikely to be exposed to volatilized contaminants from Site soils or surface water. The Site is currently zoned industrial and will likely remain so. The ROD requires deed restrictions be placed on the property to maintain the current zoning and assure it is not rezoned residential. Therefore, there will be no risk to onsite residents drinking contaminated ground water, which is the main risk any future onsite resident would encounter.

6. A citizen expressed concern about possible exposure to contaminants through the air during the excavation process.

   EPA ResDonse: Air monitoring will be conducted during the excavation process. The health and safety plan will address possible exposure as a result of the excavation process, as well as identify contingency measures to mitigate any airborne contaminant problems encountered during construction. The Commonwealth of Pennsylvania ARARs require airborne contaminants remain inside the property line which will greatly reduce any potential risk to offsite residents. In addition, community members will be informed of excavation activities at the Site before they occur.

C. Health Concerns

1. A citizen asked for a description of the harmful effects of mirex and kepone.

   EPA Response: Kepone affects the reproductive system and mirex affects the liver and adrenal glands. Exposure causes tissue death and necrosis. Presently it is unknown if kepone is a carcinogen (weight of evidence Class D), but mirex has been classified as a possible human carcinogen (weight of evidence Class C).

2. A citizen asked whether residents of State College should be

drinking bottled water because of the Site's contamination of the groundwater.

EPA Response: The plume of contamination from the Site is located entirely between the plant and the stream and has not affected the drinking water supply. Based on EPA's investigations and site files, the Site has never had an impact on the water consumed by nearby residents. Their drinking water is supplied by the Lemont Water Company and does not come from groundwater under the Site. Further, EPA's actions at the Site will prevent any future contamination from occurring.

D. Miscellaneous

1. A citizen asked for a definition of onsite.

EPA Response: In EPA documents, onsite refers to the Ruetgers-Nease property (including the operating facility, former spray fields, etc.) area only, and offsite refers to areas outside of the plant area. However, the entire Centre County Kepone Superfund Site is defined as all areas impacted by contaminants originating from the Ruetqers-Nease plant site, and currently includes all of the plant area, the area underlain by impacted ground water, Thornton Spring, and Spring Creek from the Village of Lemont to the Pennsylvania Fish Commission Research Station. All of these areas are addressed in the Proposed Plan.

2. A citizen asked whether chemicals were ever disposed on the upper side of the mountain or near the fire pond.

EPA Response: Ruetgers-Nease files indicate that all disposal occurred on the Site property.

3. A local official asked whether the contamination extends outside of the Ruetgers-Nease property boundary.

EPA Response: Yes. Groundwater contamination extends from the plant site to Thornton Spring, and can be found under several properties located "downgradient" from the Ruetgers Nease property. Traces of VOCs were detected in two wells located offsite and downgradient from the Ruetgers-Nease property, although at much lower levels than onsite.

4. The same local official commented that College Township is considering rezoning the Abramson property and asked whether the area would be considered part of the Site or become involved in the cleanup.

EPA Response: No. The direct cleanup covers the Ruetgers-Nease property only and other limited offsite areas including the FWDD and Thornton Spring. The official was advised, however, to be aware of the environmental concerns in the area, and to consider these concerns thoroughly as part of any rezoning activities.

PART II: COMPREHENSIVE, TECHNICAL, AND LEGAL RESPONSE TO COMMENTS

This section provides technical detail in response to comments or questions on the Centre County Kepone Site. These comments or questions were received at the October 19, 1994 public meeting or by mail or telephone during the public comment period, and may have been covered in a more general fashion in Part I of this Responsiveness Summary. The following specific comments are addressed:

A. Comments of Golder Associates
B. Comments of U.S. Fish and Wildlife Service, Pennsylvania Fish and Boat Commission, and the U.S. Department of Interior Office of Policy and Compliance
C. Comments of Spring Creek Chapter Trout Unlimited
D. Comments of Pennsylvania Department of Environmental Resources
E. Comments of Various Citizens

A. Golder Associates Comments

In an 8-page document dated November 30, 1994, Golder Associates (Golder) commented on the Proposed Plan on behalf of Ruetgers-Nease Corporation. The document included numerous editorial and clarification comments (which are acknowledged by EPA), as well as several specific technical comments regarding the Proposed Plan. These specific technical comments follow:

1. PRP Comment #11: Additional sampling should be limited to riparian area soils of Spring Creek within the original Study Area, and sediments in the lower portion of the FWDD and Thornton Spring. Additional sampling beyond the Benner Fish Hatchery is unwarranted based upon the data previously collected by PaDER. The PaDER data includes sample points in Blanchard Lake which were non-detect for both mirex and kepone.

   EPA Response: The actual scope of the supplemental Spring Creek sampling program is yet to be determined. However, given that both kepone (36.9 ug/kg) and mirex (36.9 and 26.9 ug/kg) were detected at the Benner Spring sediment sampling station during the RI, the extent of kepone and mirex in the Spring Creek sediment below Benner Spring is currently unknown. Consequently, additional sediment sampling stations downstream of Benner Spring are being considered.

2. PRP Comment #14: EPA's stated objective for the selected alternative amounts to removal of VOCs in soil to protect groundwater from impacts due to leaching. This objective can be equally satisfied by capping or soil vapor extraction (SVE). We believe EPA should reconsider its preferred alternative for soils and at least permit pilot testing of SVE at RNC's option to establish its effectiveness at the Site.

   EPA Response: As stated in the feasibility study for the Site, effective implementation of SVE will be difficult because of the low hydraulic conductivity of the soils (about 1x10-7 cm/sec) and the perched water table conditions. Difficulties may also be encountered by the potential need for hydrofracturing near active plant facility buildings, and the placement of piping through the plant area. Given these uncertainties regarding implementation and effectiveness, SVE was not selected for further evaluation.

   However, SVE may be reconsidered if the selected remedies demonstrate limited success in the objectives of containment of VOC contamination and ground-water treatment. Consequently, EPA does not object to pilot testing of the SVE technology concurrent with the implementation of the preferred alternative provided it does not interfere with the schedule for remedial design/remedial action, although SVE testing will not be specifically addressed in the ROD.

   Capping was not selected for further evaluation since contaminants would remain in soils at levels above acceptable levels and would not satisfy the threshold criteria for overall protection of human health and the environment as established in the NCP.

B. U.S. Fish and Wildlife, Office of Environmental Policy and Compliance, and Pennsylvania Fish and Boat Commission Comments

Comments prepared and submitted by various federal and state agencies indicated similar concerns which are summarized and addressed in the following section. Similar comments were received from the following agencies:

- In a prepared statement presented at the October 19, 1994 public meeting and in a subsequent 2-page written submission of this statement, the United States Department of Interior Fish and Wildlife Service (F&WS) commented on the Proposed Plan for the Site.

- In another prepared statement presented at the October 19, 1994 public meeting and in a subsequent 4-page written submission of this statement, The Pennsylvania Fish and Boat Commission (PFBC) commented on the Proposed Plan for the Site.

- In a 6-page letter dated October 31, 1994, the United States Department of Interior, Office of the Secretary, Office of Environmental Policy and Compliance (OEPC) commented on the Proposed Plan for the Site.

The F&WS and PFBC statements and OEPC letter raised the following general concerns, which are summarized as follows:

1. F&WS/OEPC Summary Comment #1: The F&WS and OEPC believe that wildlife is at risk from contaminants present in the soil of the 15-acre grassy field adjacent to the plant Site, and that this area should be addressed further.

   EPA Response: EPA acknowledges that there is some uncertainty regarding the ecological risks associated with the 15-acre grassy field adjacent to the plant Site. Consequently, additional sampling and a subsequent reassessment of the ecological risks posed by the contaminants in this area are currently planned to resolve the uncertainty. Any further action required for this area will be addressed at a later date as part of the Proposed Plan and subsequent Record of Decision (ROD) for OU2. However, it should be noted that the Former Drum Staging Area, which considered part of 15-acre grassy field, will be addressed under OU1.

2. F&WS/PFBC/OEPC Summary Comment #2: The F&WS, PFBC, and OEPC are concerned that the preferred alternative may adversely affect both Thornton Spring and Spring Creek, with respect to altering the integrity of Thornton Spring (as related to flow and contaminant flux), and increase thermal loading to Spring Creek. Consequently, they request that the preferred alternative be re-evaluated further to assess these concerns. Further, the OEPC indicates that the preferred alternative for the ground-water/Thornton Spring should be the most protective alternative (GW/TS-4), or at least a combination between GW/TS-4 and the Proposed Plan alternative GW/TS-3. In addition, the PFBC also indicates that Thornton Spring should be treated for contaminants of concern at its source.

   EPA Response: EPA recognizes the importance of thermal loading on the resources of Spring Creek. A study is currently underway which is further evaluating the thermal effects of Thornton Spring flow on the Spring Creek watershed. Based on the results of this study, EPA proposes to develop a thermal loading performance standard for any action implemented which potentially effects flow at

Thornton Spring. This performance standard, which will be further developed during the Remedial Design phase, is intended to prevent unacceptable thermal loading of the Spring Creek cold water resource.

With respect to the treatment of contaminants at Thornton Spring, this alternative has several limitations. First, this alternative provides limited overall protection as it would continue to allow contaminants to migrate from the Site to Thornton Spring. Further, it has been demonstrated in the FS that this alternative would be difficult (although not impossible) and most costly to implement because of various technical complications. The system evaluated in alternative GW/TS-4 would be extensive, and would initially require acquisition of and rezoning of property in the vicinity of Thornton Spring, followed by the development of considerable spring flow control structures, the construction of a treatment plant capable of treating an average of 250 gpm and up to 3000 gpm, and the construction of a 500,000 gallon clear well to equalize flow to the treatment system. Such a system constructed in the vicinity of Thornton Spring could have numerous adverse social and environmental impacts.

3. F&WS/PFBC/OEPC Summary Comment #3: The F&WS, PFBC, and OEPC indicate that the contaminated sediments in Thornton Spring and the lower portion of the FWDD should be addressed given the environmental receptor risks posed by the sediments in these areas.

   EPA Response: Further assessment of the contaminated sediments of Thornton Spring and the lower portion of the FWDD is currently planned. Any further action required for these areas will be addressed at a later date as part of the final Proposed Plan and subsequent final Record of Decision (ROD).

4. F&WS/OEPC Summary Comment #4: The F&WS and OEPC concur that additional characterization of Spring Creek riparian-area soil and sediments is required prior to a final determination of remedial action for this portion of the Site.

   EPA Response: No response is necessary.

C. Spring Creek Chapter Trout Unlimited Comments

1. In a 4-page letter dated October 28, 1994, the Spring Creek Chapter of Trout Unlimited (SCCTU) commented on the Proposed Plan for the Site. The SCCTU letter raised concerns that the potential for thermal degradation of Spring Creek as a result of the actions described in the Proposed Plan has not been adequately addressed. The SCCTU requested that "...some other treatment and discharge alternative be considered to prevent any further thermal degradation to Spring Creek."

   EPA Response: See EPA response presented in Part II, Section B, Response #2.

D. Pennsylvania Department of Environmental Resources Comments

In a 3-page document dated October 25, 1994, the Commonwealth of Pennsylvania Department of Environmental Resources commented on the Proposed Plan. The specific comments of this letter follow:

1. With regard to groundwater contamination, PADER is concerned that the preferred alternative GW/TS-3 will not provide adequate control to prevent the migration of contaminants

from the Site to Thornton Spring and ultimately Spring Creek. This basis for this concern is related to the Site's karst geology where subsurface flows follow fractures and solution channels. The interception of all of these pathways to prevent any offsite migration by the series of wells is a hit or miss solution.

Given these concerns, PADER prefers alternative GW/TS-4, which includes source control wells and treatment at Thornton Spring in lieu of the migration control wells. This would ensure that the source of the contaminants entering Spring Creek via Thornton Spring would be eliminated, as well as eliminating the direct contact threat the spring discharge presents. PADER would, however, like to remove the in-situ portion of the remedy solution because an adequate treatment system would most likely require external units.

Realizing that alternative GW/TS-3 does have the potential to achieve the remediation goals relative to the protection of Thornton Spring and Spring Creek, PADER will agree with the selection of this alternative only if it includes a provision for implementation of a collection and treatment system at Thornton Spring if statistically significant reductions of contaminant levels are not attained within five years of remedy implementation.

EPA Response: The ROD will include a performance standard for the surface water at Thornton Spring which requires no less than a 20% reduction per year in the baseline contaminant concentrations established during the remedial design over a five year period or compliance with the substantive requirements of the NPDES discharge regulations set forth in 25 PA Code § 92.31, and the Pennsylvania Water Quality Standards (25 PA Code 55 93.1-93.9). Should this performance standard not be attained, the ROD will require supplements or modifications to alternative GW/TS-3, which could incorporate elements of alternative GW/TS-4, which includes the collection and treatment of surface water at Thornton Spring.

2. With regard to soil remediation, PADER concurs with the selection of alternative SS-2 (excavation and offsite disposal of contaminated soils), however, it is not convinced that this activity should be limited to those areas which are easily accessible. PADER has been involved with remediations at other facilities where structures have been relocated in order to provide access to contamination. We have not been provided sufficient information in this case to indicate that relocation of the tank farm, whether on a temporary or permanent basis, is not a viable option to allow access to the contaminated soils in this area. The highest levels of soil and ground-water contamination on the Site have been documented in the tank farm area. If this contamination is left in place in its current state, contaminants will continue to leach into the groundwater precluding the ground-water pump and treat system from achieving its remediation goal. In addition, while alternative SS-2 includes a series of source control wells in this vicinity, the absence of an aquitard layer at a reasonable depth beneath the tank farm eliminates any assurances that contaminants will not simply migrate downward and elude the capture zones of these wells.

   EPA Response: Given that the Ruetgers Nease plant site is an active on-going operation, the relocation of major plant facilities could be highly disruptive and costly to plant operations. Although it is acknowledged that residual contamination will remain in areas inaccessible to excavation, the combination of remedies selected for the site is expected to meet the overall remedial objectives for the Site. However, the overall effectiveness of the entire preferred remedy (including soil, sediment, and ground-water elements) will be evaluated after implementation and during scheduled 5-year reviews in accordance with Section 121(c) of CERCLA. Should the selected remedies not be successful in meeting the remedial objectives, additional measures may be identified and implemented (such as SVE) to further address the subsurface soil in the main plant area.

3. With regard to the Freshwater Drainage Ditch surface water and sediments, PADER concurs with the preference of alternative FWDD/SW-2A and FWDD/SED-2. However, PADER specifies that all contaminated soil that is encountered be remediated according to the Departments December, 1993, guidance document "Cleanup Standards for Contaminated Soils."

   EPA Response: EPA has incorporated, where appropriate, the PADER guidance into the soil/sediment cleanup criteria being developed for the Site, although these guidelines are "To Be Considered (TBCs)" rather than ARARs. Only two compounds, methylene chloride and tetrahydrofuran, are affected by the State's TBC standards. These two compounds were detected during the Remedial Investigation and were not considered in the Summers Model presented in the Feasibility Study.

4. With regard to Spring Creek sediments, PADER concurs with the rationale behind the preferred alternative SC-2, but has several qualifications. With regard to the fish tissue sampling, PADER specifies that it be done according to DER protocol (PADER Publication #33), during the Department's preferred seasons (August and September) and finally that the three stream sites that have been historically sampled by the Department and the Fish Commission be utilized. In addition, should fish tissue body burdens ever decrease to the point that the Department and the Pennsylvania Fish and Boat Commission consider opening up the Spring Creek fishery, a more intensive short-term survey would be required. This would include more stream locations to be sampled, additional fish species to be collected, and more seasons to be sampled before the final decision to open the fishery be made.

   PADER believes that the proposed plan should retain alternative SC-3 (or a hybrid version) for future consideration. The trigger mechanism for initiation of this alternative would rely upon kepone and mirex concentrations in Spring Creek sediment and fish tissue. These levels would be evaluated during the five-year review mandated by CERCLA Section 121(c). If kepone and mirex levels exceed the 10 ppb cleanup standard, remediation of Spring Creek sediments, as well as Thornton Spring sediments, should be required.

   EPA Response: The specific details regarding the proposed fish monitoring program will be developed during the Remedial Design phase of the project. All relevant recommendations regarding the frequency and scope of fish tissue sampling activities program will be evaluated and incorporated into the final monitoring program.

   With regard to retaining alternative SC-3 for future consideration, additional sampling and further evaluation of

Spring Creek sediments are proposed. Based on the results of this additional study, additional remedial alternatives addressing Spring Creek sediments, including hydraulic/vacuum dredging (i.e. alternative SC-3), may be considered during the 5-year review process. If any further action is required for Spring Creek sediments, it would be addressed in a ROD amendment or in an Explanation of Significant Differences ("ESD").

E. Additional Various Citizen Comments

Various other written comments were received from several citizens regarding the Proposed Plan. The detailed comments, including a 3-page letter from one citizen are presented first, followed by other comments submitted by various other citizens.

Comments presented in a 3-page letter submitted by one citizen include:

1. Given the citizens' observations regarding the general improvement in apparent stream quality and the expected effectiveness of alternatives GW/TS-3 and SS-2 to further reduce contamination, this citizen indicated that fencing the spring and its tributary is not necessary. Although fencing would potentially restrict direct access to the spring and stream and subsequently direct contact with contaminated water and sediments, it would do little to prevent the inhalation of VOCs in the air unless the "fenced in area" included a large portion of the citizens' property and that of their neighbor. As an alternative, this citizen recommends that the water from the spring be diverted into a drainage pipe from the upwelling to Spring Creek. Such action would greatly reduce the potential for inhalation of VOCs and direct contact with contaminated water and sediment. Although probably more expensive than fencing, future maintenance costs would be greatly reduced and potential access virtually eliminated. Although the Pennsylvania Fish and Boat Commission may object to burying the stream on the basis of a significant loss of habitat, the entire tributary represents approximately 300 feet of channel and in terms of the entire Spring Creek drainage a very small percentage of available habitat.

   EPA Response: The exact locations and specifications for the areas to be fenced will be decided during the Remedial Design phase of the project.

   With regard to the recommendation of "piping" Thornton Spring from its upwelling to Spring Creek, this alternative was considered, but rejected during the early phases of the FS. This alternative was eliminated from further review because of problems associated with technical implementability related to highly variable flows, and major administrative issues related to limited property access and the constraints that are associated with the spring being a regulated water body.

2. What are the specific VOC's in the air near Thornton Spring and its tributary? How were these data used to calculate potential health risks to current and future residents living near the spring and its tributary? Since the VOC concentrations were considerably lower in 1990 and 1992 when air sampling was conducted, what are the potential health risks to current residents associated with concentrations that may have been many times greater?

   EPA Response: A total of 16 different chemicals were detected in the air during the two phases of air sampling at

Thornton Spring, including: acetone, benzene, 2-butanone, chlorobenzene, cis-1,2-dichloroethene, trans-1, 2-dichloroethene, 1, 2-dichlorobenzene, ethylbenzene, 1, 1, 2, 2 -tetrachloroethane, toluene, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, trichloroethene, trichlorofluoromethane, vinyl chloride, and xylene. It should be noted that only a few of these compounds were detected in any given air sample.

With regard to how the air data are used to calculate potential health risks, see the EPA Response to Part I, Section B, Comments #1, 2, 3, 4, and 5.

With regard to the portion of the question about potential health risks associated with exposures prior to 1990 and 1992, the Superfund risk assessment process is generally concerned with current or future exposures. Consequently, historical exposures are not typically addressed.

3. What is meant by "institutional controls such as deed restrictions at Thornton Spring?" This statement appears in several places in the proposed plan but is never defined. Does this statement apply to the tributary that flows from the spring to Spring Creek? The area is currently zoned residential, although it is indicated on page 12 that it is industrial. Does the above statement infer that zoning would be changed or that nearby property owners would be restricted in selling their property? Such restrictions could have a negative impact on the value of adjacent properties and on the property owners' ability to sell it. If such restrictions are to be implemented, EPA, DER, or Ruetgers-Nease should consider buying the properties adjacent to the spring.

   EPA Response: The scope of any deed restrictions that may be considered necessary to meet the institutional control objective will be determined during the Remedial Design phase. Extensive deed restrictions will only be necessary if additional measures beyond those proposed are required to limit future exposure to residual contaminated surface water and sediments in the vicinity of Thornton Spring. Possible deed restrictions could include the prohibition of the use of spring water for potable or non-potable uses, future building or improvement setback/encroachment requirements at the spring site, limitations on future land uses at the spring Site, etc. Any deed restriction proposed will be carefully analyzed to ensure that any potential impact on nearby property values or land use are minimized.

4. It is stated on page 17 that periodic sampling of groundwater, Thornton Spring surface water, and the treatment system influent and effluent will be conducted. Does EPA infer by this statement that air quality and sediments will not be monitored in the future? Furthermore, how frequent is "periodic sampling?" Once per year? Once every three years? Future sampling of all contaminated resources needs to be conducted on a routine basis and should be precisely defined in the Proposed Plan.

   EPA Response: The appropriate monitoring frequency of groundwater, Thornton Spring surface water, and the treatment system influent and effluent will be formally established during the upcoming Remedial Design phase of the project. However, for the purposes of developing cost estimates for the FS, monitoring wells and surface water from Thornton Spring were proposed to be sampled quarterly for VOCs, annually for mirex and kepone, and biannually for photomirex. Further, treatment plant effluent and influent were proposed to be sampled monthly for VOCs and sampled biannually for mirex, kepone, and photomirex (effluent only).

With respect to air sampling, none is currently proposed to be routinely conducted given that the baseline risk assessment identified no unacceptable exposures to air. However, air monitoring will be performed, as necessary, to ensure that the proposed action will meet the appropriate emission limitations and health and safety concerns.

With respect to additional sediment testing, the contamination of sediments in Thornton Spring and Spring Creek will be further evaluated. Any further action required for this media, including sediment quality monitoring frequency, will be addressed at a later date as part of the final Proposed Plan and subsequent final Record of Decision (ROD).

5. Onsite and offsite references need to be clearly defined, particularly in reference to Table 1 and the potential risk scenarios. It appears that "onsite" refers to the Ruetgers-Nease facility and not Thornton Spring. However, in several instances in the report, references to the spring and onsite are used together giving the impression that the spring is considered "onsite." Obviously, anyone living near Thornton Spring is subject to a greater risk than someone living further from the spring. Consequently, the "current offsite" and "future offsite" populations listed in Table 1 should be clearly defined and perhaps stratified to include those located relatively close to the spring and the onsite facility and those that live at a greater distance from either the spring or Ruetgers-Nease.

   EPA Response: For the Centre County Kepone Site, the Site is defined as all areas impacted by contaminants originating from the Ruetgers Nease plant site, including but not limited to, areas underlain by contaminated ground water, Thornton Spring, and portions of Spring Creek. With regard to the risk scenarios, "onsite" is defined as the area within the property boundaries of the Ruetgers-Nease Chemical plant proper. Consequently, "offsite" is defined as those areas outside of the Ruetgers Nease property boundaries, and directly includes such areas as Thornton Spring and Spring Creek, as well as other areas outside of the property boundaries.

   During the human health risk assessment, certain assumptions are made regarding realistic and complete exposure pathways (i.e. potential contact with contaminated soil, sediment, surface water, ground water, and air) with respect to a targeted population, including workers, trespassers, residents, and visitors. These conservative assumptions are employed to ensure those populations with the greatest potential risk are identified and assessed in the risk assessment. All reasonable populations with some potential for risk are assessed, whereas populations with no potential for risk are excluded from the assessment.

   For this Site, there were three current or future "offsite" target populations that were assessed to be potentially at risk. The "offsite resident" was defined as those people who live directly adjacent to Thornton Spring (the population with the most likely potential for risk); the "offsite floodplain resident" was defined as those people who live directly along the floodplain of Spring Creek, and; the "recreational visitor" was defined as those people who occasionally frequent Spring Creek for fishing, wading, or other water contact activities. No other offsite populations were determined to be potentially at risk.

No unacceptable risks were identified for any current or future offsite populations investigated during this study.

Other comment submitted by citizens are:

6. A citizen expressed concern that soil remediation also consider mirex and kepone concentrations in addition to the volatile organic compounds (VOCs), as mirex and kepone are also present at very high concentrations. Further, a concern was expressed that the remedial alternatives chosen be properly implemented on the full extent of the contamination as demonstrated by a sufficient and convincing sample network.

   EPA Response: The actions proposed for this Site are intended to address the mirex and kepone (as well as the voc) contamination in the soil, sediment, ground water and surface water. Appropriate cleanup criteria for mirex, kepone, and VOCs are currently being developed.

   EPA's preferred remedial alternative for the Site is intended to provide protection of human health and the environment. While it is recognized that not all of the contamination will be completely removed by the preferred alternative, the unacceptable risks associated with any residual contamination will be adequately mitigated by the proposed action to ensure human health and environmental protection.

7. A citizen expressed concern that the Site report was extremely difficult to follow, and raised the point that the document be made clearer so that every citizen could understand it. Further, this citizen asked if there was any way to speed up the process of cleaning up this environmental site.

   EPA Response: EPA recognizes that the RI/FS report for this project is a very complex document, but this level of technical detail is required to present the scientific information necessary to evaluate and determine the most appropriate cleanup approach for the Site. Realizing that these complex technical reports can be difficult to understand, EPA has developed several non-technical general information fact sheets and other background documents which summarize the cleanup program and complex Site issues. These easy-to-read summary documents are included in the Administrative Record, which is available for review from information repositories located at the Schlow Library and EPA Region III in Philadelphia.

   With regard to the duration of the cleanup process, see the EPA response provided for Part I, Section A, comment #6.

RESPONSIVENESS SUMMARY SUPPLEMENT
FOR THE REVISED PROPOSED REMEDIAL ACTION PLAN
AT THE
CENTRE COUNTY KEPONE SUPERFUND SITE
CENTRE COUNTY, PENNSYLVANIA

Public Comment Period:
January 27, 1995 thru February 25, 1995

TABLE OF CONTENTS

RESPONSIVENESS SUMMARY SUPPLEMENT - REVISED PROPOSED PLAN
CENTRE COUNTY KEPONE SITE
STATE COLLEGE, PENNSYLVANIA

This responsiveness summary supplement is divided into the following sections:

Overview: This section discusses the revisions to EPA's preferred alternative for remedial action.

Part I: This section provides a comprehensive response to all significant comments and is comprised primarily of the specific legal and technical questions received during the public comment period for the revised proposed plan.

This portion of the responsiveness summary is intended to address the comments raised for the revised proposed plan only, but is also intended to supplement the comprehensive responsiveness summary completed for the original proposed plan.

OVERVIEW

In October 1994, EPA announced the opening of the public comment period and published its preferred alternative for the Centre County Kepone Site, located in State College, Centre County, Pennsylvania. However, based on further evaluation and comments received during that public comment period, EPA issued a revised Proposed Plan in January 1995 for the Site. The revised Proposed Plan addressed and clarified a number of issues raised during the initial public comment period. A summary of the major Proposed Plan revisions are as follows:

! Operable Unit Designations - EPA has divided the planned remedial action into two operable units (OUs) to simplify and expedite action at the Site.

OU1 will remediate the principal threats at the Site which are VOC contamination in the ground water and surface water, mirex and VOC contamination in on-Site soils and sediments (excluding the Former Spray Field Area), and mirex in fish tissue.

OU2 will address the final response actions for soils in the riparian-areas of Spring Creek and the 15-acre Former Spray Field Area, and sediments from the lower portion of the freshwater drainage ditch and Thornton Spring. These areas were not fully characterized during the RI/FS and sampling efforts will be required for these areas prior to the development of final response actions.

Together, OU1 and OU2 will remediate the Site by addressing the principal threats posed by the Site. The final response actions for OU1 are addressed in the revised proposed plan.

! Cleanup Criteria - EPA has developed cleanup levels for contaminated soil and sediment at the Site. Neither state nor federal applicable or relevant and appropriate requirements (ARARs) exist for the chemicals of concern at the Site, and consequently, cleanup levels for VOCs, mirex, and kepone were developed to reflect levels of contaminants that will be protective of ground water, environmental receptors, and to meet the ground-water ARARs. These cleanup levels are included in the revised proposed plan.

! Miscellaneous Technical Clarifications - Several additional technical clarifications were presented in the revised proposed plan, and are summarized as follows:

Thermal Loading for Spring Creek: A common component for the ground-water extraction systems described in the revised proposed plan includes an analysis of the final design and the projected thermal effects to Spring Creek. If necessary, mitigation plans will be included as part of the remedial design to maintain the existing thermal regime of Spring Creek.

Thornton Surina Monitoring: The surface water from Thornton Spring will be monitored prior to initiating operation of the ground-water extraction system. The purpose of the monitoring is to establish the baseline contaminant concentrations at Thornton Spring and evaluate the performance of the ground-water extraction system during operation.

Designation of Excavation Areas: Under alternative SS-2, contaminated soils from the more isolated and unobstructed areas on the Ruetgers-Nease property would be excavated where concentrations of VOCs exceed levels that are protective of ground water. These areas include, but are not limited to, the Former Drum Staging Area, the Designated Outdoor Storage Area, and the Tank Farm/Building #1 Area. Cleanup levels for the soils in these areas are provided in the revised proposed plan.

With the exception of the above changes and other minor editorial and clarification revisions throughout the revised proposed plan, there were no other changes to the original proposed plan.

PART I: COMPREHENSIVE, TECHNICAL, AND LEGAL RESPONSE TO COMMENTS

This section provides technical detail in response to comments or questions on the revised Proposed Plan for the Centre County Kepone Site. These comments or questions were received via mail during the public comment period from January 27 through February 25, 1995. The following specific comments are addressed:

A. Comments of Golder Associates
B. Comments of Pennsylvania Fish and Boat Commission
C. Comments of the U.S. Department of Interior Office of Policy and Compliance
D. Comments of Pennsylvania Department of Environmental Resources

A. Golder Associates Comments

In an large document dated February 24, 1995, Golder Associates (Golder) commented on the revised Proposed Plan on behalf of Ruetgers Nease Corporation. The document included a 7-page summary letter with 6 additional attachments of other correspondence regarding the Site dated November 30, 1994 through February 8, 1995. The following major comments were presented:

1. The 10 ppb soil cleanup levels for mirex and kepone are unnecessary to achieve the remediation sought by EPA, and moreover, are without scientific justification and inconsistent with the National Contingency Plan (NCP).

   EPA Response: The 10 ppb soil cleanup levels developed for the Site are intended to be protective of environmental receptors. Because of their chemical properties, these compounds require that their residual levels in soil be allowed only at very low concentrations for the following reasons:

! They are very resistant to degradation, with very long residual half-lives;

! They bioaccumulate in the food chain;
They bioconcentrate in ecological receptors;

They adversely impact members of both the plant and animal kingdoms; and

! Despite their adsorptive properties, both contaminants have been transported some distance from the original source, the RNC plant site, and, in fact, the certain extent of contamination is as yet unknown.

Both compounds strongly adhere to soil and sediment and are made potentially more available to soil microorganisms found in soils with elevated concentrations of organic carbon. Mirex inhibits photosynthesis in plankton at levels as low as 1 ppb. Some fish are adversely impacted by levels as low as 7 :g/l. Reports indicate that some soil microflora are sensitive to levels as low as 0.01 :g/kg. Consequently, the 10 ppb criteria are considered protective. A detailed technical description of the effects of mirex and kepone on environmental receptors, with supporting bibliography, is presented in Attachment 1 of this responsiveness summary.

The general technical basis for the development of the assumptions used to develop the 10 ppb criteria for mirex and kepone are included in the Region III Interim Ecological Risk Assessment Guidance. The Interim Guidance clearly states that the conservative approach is preferred in cases where a complement of information is not available (e.g., bioaccumulation studies, body burden of contamination, study of endpoints of impacts specific to mirex and kepone, i.e. endocrine system), as the situation regarding the site. EPA Region III assesses risk on a habitat basis rather than by specific ecological receptors, in most cases, since remedial investigations are not set up to carry out the kinds of detailed surveys needed to identify and assess potential impacts to all ecological receptors in a given area. Therefore, sensitive species that may be found in or using a given area have not been individually considered. This is the case with the Centre County Repone RI, therefore the conservative approach in determining protective cleanup targets is preferred. Specific details regarding the assumptions used by EPA to calculate the reasonable worst case scenario are included in Attachment 2 of this responsiveness summary.

In summary, risk assessment is the basis for determining the target cleanup level for risk management and based upon the EPA Region III screening level risk assessment approach, the cleanup level could be extremely low. EPA's rationale for selecting the 10 ppb number was based on information from the RI coupled with a revised toxicological evaluation originally presented in the risk assessment and some compromises dictated by technology and economics. The screening results are as follows:

! A screening level risk assessment shows a potential for risk at 1 ppb and if the uncertainty factor of 100 (applied to protect unrelated species) were to be factored in, we would recommend a cleanup target of 0.001 ppb.

! The reasonable worst-case scenario shows a potential for risk at about a factor of 10 which would still make a case for recommending less than 1 ppb as a target cleanup number.

Despite the evidence justifying the 10 ppb (or less) cleanup criteria, EPA recognizes that there are analytical concerns regarding the ability to assess this low level of kepone and mirex contamination in the soil and sediments. To address this concern, EPA is proposing a standard of performance that is equivalent to the 10 ppb cleanup criteria for the FWDD sediments which will attain the remedial objectives for protection of environmental receptors. This performance standard will require that the upper 24 inches of sediment/soil be removed from the FWDD (regardless of kepone and mirex concentrations). The upper two feet of sediment/soil is where the greatest biological activity is found and includes the topsoil and A horizon. In addition, the two foot depth harbors the food organisms for a wide variety of predators ranging from insects through mammals and birds. Should volatile organic contamination be detected below the 24-inch depth in excess of the soil cleanup criteria for protection of groundwater, additional excavation will be required. Once all of the contaminated sediment/soil has been removed, the area will be backfilled to grade.

2. The soil cleanup levels for organic compounds are inappropriate: (a) as to the PADER interim cleanup standards because PADER no longer supports the use of these standards made by EPA in the revised PRAP, and their use is inconsistent with the NCP; and (b) as to the Summers Model because the effects of existing controls have not been considered.

   EPA Response: The soil cleanup standards presented in the revised proposed plan was a combination of the results from the Summers Model presented in the feasibility study prepared for the Site and PADER cleanup guidance.

   With regard to the PADER cleanup guidance, it is acknowledged that some technical concerns have been raised regarding the general applicability of these criteria. However, these criteria continue to be used by PADER presently throughout the Commonwealth pending the development of new guidelines, which are expected to be issued within the next 18 months to 36 months. Consequently as a result of the current status, this cleanup guidance is currently being used to support feasibility studies at other Region III sites in Pennsylvania, including the AIW Frank and Middletown sites. Therefore, the criteria are considered appropriate for the Site. As a result, only two compounds, methylene chloride and tetrahydrofuran, are influenced by the criteria. These two compounds were detected during the Remedial Investigation and were not considered in the Summers Model presented in the Feasibility Study.

   With regard to the applicability of the results from the Summers Model presented in the Feasibility Study, EPA's intent is to develop one set of cleanup criteria to be applied to all soil and sediment addressed under OU1, including subsurface soil located under paved areas in the plant area, soil located in the Former Drum Staging Area, and sediments in the FWDD. It is acknowledged that inclusion of the effects of pavement in the Summers Model would produce a less conservative set of criteria than those selected. However, preference was given to a single conservative set of criteria for soils and sediments since lateral infiltration of groundwater through adjoining unpaved areas or subsurface drainage is possible at the Site which would result in the release of contaminants to groundwater. In addition, there are no assurances that the paved surfaces would remain paved for an infinite time period.

3. Soil Vapor Extraction (SVE) has not been given appropriate consideration, which is inconsistent both with the requirements of the NCP and EPA Region III's consistent practice at all other sites.

   EPA Response: EPA has considered SVE extensively as part of the remedial alternative evaluation process, and this review is consistent with the Threshold and Primary Balancing Criteria set by the NCP (40 CFR 300.430(f)). As stated in the feasibility study for the Site, effective implementation of SVE will be difficult because of the low hydraulic conductivity of the soils (about 1x10-7 cm/sec) and the perched water table conditions. Difficulties may also be encountered by the potential need for hydrofracturing near active plant facility buildings, and the placement of piping through the plant area. Given these uncertainties regarding implementation and effectiveness, SVE was not selected for further consideration as part of the preferred remedy for the Site.

   However, SVE may be reconsidered if the selected remedies demonstrate limited success in the objectives of containment of VOC contamination and ground-water treatment. Consequently, EPA does not object to pilot testing of the SVE technology concurrent with the implementation of the preferred alternative provided it does not interfere with the schedule for the remedial design/remedial action. However, SVE testing will not be specifically addressed in the ROD.

B. Pennsylvania Fish and Boat Commission Comments

In a 3-page document dated February 24, 1995, the Pennsylvania Fish & Boat Commission commented on the revised Proposed Plan. The following comments were presented:

1. The PFBC recognizes Spring Creek as an outstanding aquatic resource, and agrees that a component of any system removing or discharging additional water to Spring Creek must include monitoring and design to maintain the existing thermal regime of Spring Creek. In addition, the PFBC views Thornton Spring as a stream capable of supporting a significant aquatic community, and are concerned that this stream will not be returned to a condition that could support aquatic life in the near future. Consequently, the PFBC prefers alternative GW/TS-4, an expansion of the existing ground water extraction and treatment system with a surface discharge plus in-situ treatment of Thornton Spring.

   However, if GW/TS-3 is the alternative that is designed and implemented, the PFBC supports rapid reduction in contaminant levels at Thornton Spring, establishment of performance standards to achieve contaminant reduction, and regular monitoring to determine if standards are met. Failure to effectively reduce contaminant levels should lead to system redesign or supplementation.

   EPA Response: The ROD will include a performance standard for the surface water at Thornton Spring which requires no less than a 20% reduction per year in the baseline contaminant concentrations established during the remedial design over a five year period or compliance with the substantive requirements of the NPDES discharge regulations set forth in 25 PA Code § 92.31, and the Pennsylvania Water Quality Standards (25 PA Code §§ 93.1-93.9). Should this performance standard not be attained, the ROD will require supplements or modifications to alternative GW/TS-3 (including the expansion of the extraction well network). These modifications could incorporate elements of alternative GW/TS-4, which includes the collection and treatment of surface water at Thornton Spring.

2. Thornton Spring sediments are not addressed in any remedial action alternatives. Understanding one objective of EPA's remedy is to reduce bioavailability of contaminants in Spring Creek sediments, it follows that highly contaminated sediments in Thornton Spring should be removed. It is the experience of the PFBC in dealing with recent sediment removal projects in the Spring Creek watershed that Thornton Spring sediments can be readily removed. The PFBC agrees with EPA's proposal of a 10 ppb cleanup level for the Freshwater Drainage Ditch, and feel it should be applied to Thornton Spring sediments.

   EPA Response: The sediments of Thornton Spring will be addressed as part of OU2 activities. Removal of Thornton Spring sediments or the application of cleanup criteria will be considered during the remedial alternative evaluation phase of OU2.

3. Soil excavation is planned for isolated and "unobstructed" areas. Given the extent of contamination and potential for continuing release of contaminants via ground water, it is important that "unobstructed" be further defined so it does not simply mean inconvenient for plant operations in areas such as Tank Farm/Building #1.

   EPA Response: Unobstructed areas are defined as locations in the main plant area where remedial activities can be conducted without the major disruption of plant activities. No major facility relocation is proposed to facilitate remedial action at the Site. However, the overall effectiveness of the entire preferred remedy (including soil, sediment, and ground-water elements) will be evaluated after implementation and during scheduled 5-year reviews in accordance with Section 121(c) of CERCLA, and should the selected remedies not be successful in meeting the remedial objectives, additional measures may be identified and implemented (such as SVE) to further address the subsurface soil in the main plant area.

C. United States Department of Interior, Office of the Secretary, Office of Environmental Policy and Compliance Comments

In a 3-page document dated February 27, 1995, the United States Department of Interior, Office of the Secretary, Office of Environmental Policy and Compliance commented on the revised Proposed Plan. The following comments were presented:

1. The DOI stated that the decision to study the lower FWDD and Thornton Creek sediments further under OU-2 work is unfortunate and will result in continued exposure and unnecessary delay of protection for the environment, including DOI trust resources. The DOI is concerned by the delay, since the revised Proposed Plan does not indicate the timing of the remedial action development for OU-2. The DOI recommends that the additional studies of these areas be conducted quickly so that an effective remedy can be selected and a ROD for OU-2 can be written as soon as possible.

EPA Response: OU2 investigative activities are expected to be conducted concurrently with the remedial design phase of OU1 to accelerate the overall decision schedule for OU2. These activities are expected to begin shortly after the completion of the ROD.

2. The bifurcation of the Site into two operable units has created a remedial sequencing concern. Remediation of upland areas should logically occur first, and the FWDD sediments should be removed before treated ground water is discharged. Otherwise, contaminated soil from the field will continue to move downgradient to the FWDD, and the treated ground water discharged to the FWDD will accelerate movement of contaminated sediment to Spring Creek. The development of two OU's is particularly problematic with regard to the 15-acre spray field, since this will not be addressed until OU-2. The lower FWDD should have sediments removed before the discharge of treated ground water. Once the ground water treatment system is operating, Thornton Spring will experience lower flows, easing the removal of contaminated sediments.

   EPA Response: Although it is acknowledged that upland areas are typically addressed before downgradient areas in some remediation scenarios, the upland areas of the Site are considered relatively stable from the perspective of sediment transport. For example, the Former Spray Field area is a thickly vegetated and maintained grassy field at present, and there is little to no sediment transport from this area occurring under current conditions. Further, any future remediation of this area, if necessary, would require strict sediment and erosion control measures to prevent the migration of sediments during any type of construction activities.

   With regard to the sediment mobility in the lower portion of the FWDD, sediment transport in this ditch is typically limited to storm events given that this ditch drains a large area beyond that of the Ruetgers Nease plant site. There is usually little to no surface water flow in the lower portion of the FWDD under non-storm conditions, and much of the ditch is vegetated. The discharge of treated ground water is not expected to promote sediment transport in the FWDD, as most of the discharge is expected to disappear into the subsurface along the FWDD. However, the potential for increased sediment transport as a result of the ground-water discharge will be evaluated and addressed during the remedial design phase to ensure that minimal additional sediment is transported to Spring Creek via the FWDD.

   With regard to removal of sediment from Thornton Spring, the feasibility and necessity of this remedial alternative will be addressed as part of OU2 activities.

3. The DOI supports the revision that includes protection of the existing thermal regime of Spring Creek. The DOI requests that the FWS be consulted via the BTAG group to help determine if mitigation plans are necessary, because their cursory examination of data indicates that the existing thermal regime cannot be maintained without mitigation.

   EPA Response: All remedial design and action plans which potentially affect environmental receptors at the plant site, Thornton spring, FWDD, and Spring Creek will undergo review by the BTAG group directly and through the FWS and PFBC as part of EPA's overall technical review of all RD/RA activities.

4. The DOI does not agree that remediation of any Spring Creek sediments would cause more environmental damage than it would alleviate. The DOI requests that EPA determine the net benefits of stream sediment remediation on a site-specific basis via coordination with the BTAG.

   EPA Response: Further consideration for the remediation of Spring Creek sediments may be conducted as part of OU2 activities, based on the results of the riparian monitoring program, or will be reevaluated as part of the 5-year review process for the Site.

D. Pennsylvania Department of Environmental Resources Comments

In a 4-page document dated February 23, 1995, the Commonwealth of Pennsylvania Department of Environmental Resources commented on the revised Proposed Plan. Most of the comments provided on the revised plan were identical to those provided for the original plan, with the following exceptions:

1. The Department would agree with the selection of alternative GW/TS-3 only if it included a requirement that all contaminate levels in Thornton Spring be reduced 20-25% per year from an established baseline. If GW/TS-3 cannot achieve this yearly reduction in Thornton Spring contamination, then modifications to GW/TS-3, which could include the construction of additional recovery wells, or collection and treatment at Thornton Spring should be mandated. In addition, the PRP should be given the opportunity to implement collection and treatment at Thornton Spring (GW/TS-4) if the PRP believes it cannot meet these yearly reductions, at the outset of remedial activities.

   EPA Response: The ROD includes performance standards which require no less than a 20% reduction per year in the baseline contaminant levels in Thornton Spring. Should this performance standard not be attained, the ROD will require supplements or modifications to alternative GW/TS-3, which could incorporate elements of alternative GW/TS-4, which includes the collection and treatment of surface water at Thornton Spring.

   Should it become apparent during the RD phase (based on additional field data) that GW/TS-3 may not meet the performance criteria, additional consideration will be given to incorporating GW/TS-4 design elements into the final RD, and modifying the Record of Decision as appropriate.

2. The Department commented that in the event that large amounts of contaminated soils remain in the tank farm/building #1 area following the excavation of all contamination which can be feasibly addressed, subsequent implementation of other remedial alternatives, such as a modified soil vapor extraction system, should be considered or included as an integral part of SS-2.

   EPA Response: Although it is acknowledged that residual contamination will likely remain in areas inaccessible to excavation as part of SS-2, the combination of remedies selected for the site is expected to meet the overall remedial objectives for the Site. However, the overall effectiveness of the entire preferred remedy (including soil, sediment, and ground-water elements) will be evaluated after implementation and during scheduled 5-year reviews in accordance with Section 121(c) of CERCLA. Should the selected remedies not be successful in meeting the remedial objectives, additional measures may be identified and implemented (such as SVE) to further address the subsurface soil in the main plant area.

3. The Department clarified that the PADER level 2 cleanup standards for 2-butanone and 2-hexanone are 50 ug/kg and 210 ug/kg, respectively.

   EPA Response: EPA has revised the cleanup criteria for the Site as appropriate.

ATTACHMENT 1
SUPPORTING TECHNICAL DATA FOR MIREX AND KEPONE

MIREX

General Information: Mirex is a fully chlorinated, cage-structured compound. It is resistant to heat (decomposition at 650°C) and has low reactivity with acids, bases and other chemical agents such as ozone and lithium. It is one of the most stable of the organochlorine pesticides known and has been used widely in the southern United States for the control of the imported fire ant. An estimated 74% of the mirex used in the United States for nearly 20 years, however, has been used for nonagricultural uses, i.e., as a fire retardant in plastics.

Environmental Transport and Fate: The release of mirex in the environment has occurred via effluents from manufacturing plants and sites where mirex was utilized as a flame retardant additive to polymers and at points of application where it was used as an insecticide. Mirex is expected to persist in the environment despite the 1978 ban on its use in the United States. For the most part, mirex is resistant to biological and chemical degradation. Photolysis of mirex may occur, however sorption is likely to be a more important fate process, but sorption does not dominate. Evidence is available from the literature that mirex can degrade into kepone in the environment. Persistent compounds such as kepone and monohydro- and dihydro-derivatives of mirex have been identified as products of extremely slow transformation of mirex. Mirex bioconcentrates in aquatic organisms. It will also adsorb to organic materials in soils and sediments and is immobile.

Like kepone, mirex is mobile by virtue of its aliphatic properties. Because of its solubility characteristics, it is not readily transported as a dissolved substance in water and probably moves through the environment dissolved in aliphatic materials and/or adsorbed to particulate matter. Because of its mode of application, atmospheric contamination and dissemination are unlikely. Extensive residue surveys indicate that various factors are instrumental in the distribution of mirex, including: proximity to treated area, rate of decomposition, rainfall patterns, surface runoff, duration of exposure, seasonal population movements, avoidance behavior, trophic relationships and other habitat considerations. Like kepone, mirex thus possesses chemical characteristics that lead to concentration in nontarget terrestrial and aquatic organisms.

Mirex residues are quite persistent in various species. The resistance to mirex degradation and metabolism leads to environmental stability and biomagnification through terrestrial (including the human web) and aquatic systems. However, the fate of mirex in the environment and the associated transfer mechanisms have not been well defined. This situation is further complicated by an inability to account for almost half the mirex sold from 1962 to 1973 and in some cases, the mixing of usage data for flame retardant and fire ant control programs.

Biodegradation:

Generally, mirex is resistant to attack by bacteria and fungi and can inhibit the growth of actinomycetes, a common soil fungus. Although mirex is taken up by microorganisms, plants and higher animals including fish and rats, it is not metabolized. Yet analysis of soils from spills from sites 5 and 12 years after the accidents suggests that dechlorination takes place very slowly and kepone is a biotransformation product of mirex. Both mirex and kepone are highly persistent in the environment and have high lipid:water partition coefficients so that they bioconcentrate several thousand fold in the food chain.

Ecotoxicological Profiles:

Aquatic Toxicity: Mirex can be concentrated in fishes directly from sediments, water or food. While photodecomposition products (enhanced by interaction with aliphatic amines) can occur and are presently being used to enhance decomposition in field use, the toxicity of the resulting monohydro, dihydro and trihydro degradation products remains unknown. In addition, certain photodecomposition products accumulated on bait particles leached to seawater and the organisms in a simulated marsh concentrated one of the compounds in a manner similar to mirex itself. Decomposition products must, therefore, be included in any evaluation of the "disappearance" of the parent compound.

The biological significance of mirex is related to its chemical characteristics. Modes of transfer into living systems are important to an understanding of the impact of this insecticide on aquatic organisms. Mirex reduces productivity of green algae. Various species of phytoplankton can concentrate the pesticide and thus may serve as passive agents of transfer to other organisms. Mirex does not appear to have pronounced acute effects on fishes in a range of concentrations found in treated areas. However, dose-dependent secondary effects such as bacterial infection (goldfish) and growth inhibition (bluegills, catfish) appear to be related to mirex accumulation.

Various forms of freshwater and estuarine arthropods are extremely sensitive to mirex, with high mortality at concentrations as low as 0.1 ppb. Juvenile forms are often more susceptible and larval stages of some species show adverse sublethal reactions at concentrations as low as 0.01 ppb. Irritability and mortality have often occurred after exposure. This is the so-called delayed effect which is a distinctive characteristic of mirex in a variety of aquatic species. Although certain factors (age, size, species, physicochemical factors, etc.) influence the form and degree of response (including irritability, loss of equilibrium, paralysis and death), mirex evidently is an effective biocide for various forms of aquatic invertebrates. This is an important consideration in any evaluation of the environment impact of mirex.

Bioaccumulation: Routine applications of mirex can kill various nontarget species including oil-loving ants, spiders, beetles and crickets. Uptake and accumulation of mirex can cause reductions in seed germination, seedling emergence and growth in several plant species. This would indicate more pervasive effects than toxicity studies or residue surveys would show. Bioconcentration factors (BCFs) are as follows: algae 12200; fish 2580; snails 4900; crayfish 16860-71400; daphnids 14650. Bioconcentration factors after 70 days exposure to 0.038 :g/l; grass shrimp 13100-17400; sheepshead minnows: 28900-5000; mud crabs: 15000-18700; hermit crabs: 44800-71100; ribbed mussels (soft tissue): 42000-52600; American oysters, Crassostrea virainica, (soft tissue) 34200-73700.

Terrestrial Toxicity

Mammals: Mirex is lethal as a single dose to rats. It appears not to require metabolism in order to exert its toxicity and, in keeping with this, toxicity does not differ significantly between sexes. Thus it is likely that it would be similar in toxicity to all mammals.

The subacute toxic effects most commonly observed in mammals have included weight loss, hepatomegaly, and reproductive failure. An important feature of its effect on the liver is the induction of mixed function oxidase.

These effects have been observed at rather low levels of exposure. In rats, 1.0 ppm in the diet caused induction of cytochrome P-450 within 14 days. This is very high in comparison to chronicity factors of 5.4 for DDT and 12.8 for dieldrin, indicating a highly cumulative effect.

Birds: Birds are not extremely sensitive to the acute toxic effects of mirex. However, the relatively high levels of residues in wild birds in the treated areas and the lack of data about the possibility of reproductive effects of mirex on natural populations remains a potential problem. Signs of intoxication in mallards and pheasants from acute oral administration were mild ataxia. Withdrawal signs appeared as soon as 40 minutes after treatment. Mirex fed to captive American kestrels, Falco sparverius, produced a marked decline in sperm concentration with a slight compensatory increase in semen volume resulting in a 70% decrease in sperm numbers. No effect on sperm motility was observed. The survival of Hyalella azteca was reduced relative to that of Crangonyx pseudocracilis during exposure to mirex in water for a 13-day period. This was correlated to greater bioaccumulation of mirex by Hyalella azteca than by Crangonyx pseudogracilis.

Plants: The photosynthesis of plankton is inhibited by 16, 10, 33 and 19% after exposure to 1 ppb after 5, 10, 15 and 20 days, respectively.

KEPONE

General Properties: Kepone is the ketone analog of mirex. Like mirex, it has easily defined physical and chemical properties and saturated, symmetrical molecules. It does not occur in nature. It is released into the atmosphere as a result of its manufacture and use as an insecticide. However, its use as an insecticide has been banned in the United States. Kepone also occurs as a degradation product of mirex. The presence in Kepone of a carbonyl group in place of 2 chlorine atoms in mirex greatly affects Kepone's solubility in water which is 2,000 times that of mirex. It is also more reactive and volatile than mirex. Its thermal decomposition point is about 400°C, compared to about 600°C for mirex. Technical preparations of Kepone contain 94.4% Kepone, which 0.1% hexachlorocyclopentadiene as a minor contaminant.

Environmental Transport and Fate: Kepone released to soil adsorbs to the soil; however, some leaching to the groundwater may occur especially in sandy soils with a low organic content. Biodegradation and hydrolysis are not important fate processes, but some evaporation may be observed from the soil surface. Kepone released to water adsorbs to sediment and bioconcentrates in fish but may not bioconcentrate in crustaceans or other aquatic organisms. It does not hydrolyze or biodegrade and direct photodegradation is not significant compared to other processes. Evaporation from water is also not significant with half-life of 3.8 to 46 years predicted for evaporation from a river 1 m deep flowing at 1 m/sec with a wind velocity of 3 m/sec. Kepone released to the atmosphere will not react with photochemically produced hydroxyl radicals or ozone and will be subject to direct photodegradation. Kepone is sorbed to particulate matter in the atmosphere and is subject to gravitational settling. Exposure to kepone will occur through the consumption of contaminated food especially contaminated fish and seafood. Exposure may also occur in countries where its manufacture and use as an insecticide are still permitted.

Biodegradation: No evidence of any degradation was detected for Kepone exposed to hydrosoils from a reservoir (not previously exposed to kepone) and a creek (contaminated with Kepone) under anaerobic and aerobic conditions for 56 days. No degradation of Kepone exposed to sewage sludge was observed under anaerobic conditions for 120 hr. No degradation was reported for kepone exposed to contaminated James River sediments with added autoclaved silty clay loam soil for 52 days at a pH of 7.0.

Biotic Degradation: Kepone is very stable in the environment and is not significantly hydrolyzed. Photolysis of Kepone in the presence of oxygen results in the formation of carbon dioxide and hydrogen chloride. Irradiation of Kepone dihydrate with UV light, including wave lengths less than 290 nm, caused the formation of 2 compounds which were identical to those formed by the irradiation of mirex.

Bioaccumulation: Kepone is relatively insoluble in freshwater and in seawater. It leaches readily through few soils (highly porous sands), but is adsorbed by clays and loams, especially those with high organic content. Aquatic plant and animal species can be highly efficient in accumulating Kepone, and it is known that a large Kepone reserve can be found in the flesh of fish. The ability of different species to concentrate Kepone varies considerably, however, as a consequence of differences in depuration rates, which can be high in such organisms as oysters and low in some fishes. In general, Kepone is susceptible to transfer from particulate or food-web processes to higher trophic levels with relatively efficient mechanisms for biological magnification, including concentration in humans. The bioconcentration Factors (BCFs) are as follows: Pimephales promelas (fathead minnow) 1100-2200; Cyprinodon variegatus 1548; Leiostomus xanthrus 1221; Palaemonetes pugio 698; Callinectess sapidus 8. Brevoortia tyrannus (atlantic menhaden) 2300-9750; Menidia mendia (Atlantic silverside) 21700-60200.

Soil Adsorption/Mobility: The percent leached through soil cylinders 80 cm deep is: clay loam, 1.2% clay, 17.2% sandy clay loam, 36.8%. Using a reported range of water solubility an estimated range of Koc of 2400 to 2600 was calculated. A Koc of this magnitude is indicative of slight chemical mobility and leaching potential in soil.

Toxicity in Sediment: Suspended sediment includes mineral grains, various kinds of plankton and detritus. Each phase concentrates kepone to a different degree. Kepone concentrations in zooplankton sometimes reach levels of 16 :g/g (dry weight) while phytoplankton range form nondetectable to 2.1 :g/g. Kepone associates with the organic portion of the bottom sediments and inorganic grains are relatively clean. Therefore, a change in the ratio of inorganic to organic particles has the potential to change kepone concentrations. Benthic animals may take up kepone directly from the sediments and pass it on to organisms that prey on them.

CENTRE COUNTY KEPONE

BIBLIOGRAPHY

The abstract is based upon a search showing that kepone (chlordecone) and mirex (dodecachloropentacylodecane) impact several phyla. Citations also show a wide range in biological concentrating factors (BCF) among phyla. These factors complicate the ecological risk potential by adversely affecting normal life stage processes. In addition, the BCF values coupled with the longevity of the compounds (resistance to breakdown in the environment) broaden impacts from the physiological and food chain perspective. That is, small quantities of the biostatic compounds carry wide-ranging implications.

Citations:

Abston, A. A. & J.D. Yarbrough. 1976. The in vivo effects of mirex on selected hepatic enzymes in the rat. Pest. Biochem. Physiol. 6:192-199.

Baker et al. 1972 Induction of hepatitis mixed function oxidases by the insecticide, mirex. Environ. Res. 5:418-424.

Bahner, C.H. et al. 1977. Kepone bioconcentration, accumulation, loss, and transfer through estuarine food chains. Chesaneake Science. 10(3): 297-303.

Bender, M.E. et al. 1977. Kepone residues in Chesapeake Bay biota, Kepone Seminar II, Sept. 20 & 21, Easton, MD.

Boetcke, K.P. et al. 1972. Mirex and DDT residues in wildlife and miscellaneous samples in Mice. Pesticide Moni. Jnl. 8:14-22.

Bookhart, C.G. et al. 1979. Kepone effects on development of Callineates sapidus and Rhithopononeus. USEPA 600/3-79-104.

Brewerton, H.V. & D.A. Slade. 1964. Kepone residues on apples. New Zealand J. Agr Res. 7:647ff.

Buckler, D.R. et al. 1981. Acute and chronic effects of kepone and mirex on the fat head minnow. Trans Amer. Fish. Soc. 110:270-280.

Butler, P.A. 1953. Pesticide-Wildlife Studies - A review of FWS investigations during 1951-'62. U.S. FWS Circ. 1617: 11-25.

Byard et al. 1975. Biochemical changes in the lives of rats fed mirex. Toxicol. Appl. Pharmacal. 33:70-77.

Carlson, D.A. et al. 1976. Mirex in the environment: Its degradation to Kepone and related compounds. Science. 194: 939-941.

Chernoff, N. et al. 1974. Feto toxicity and cataracts genecity of mirex in rats and mice with notes on Kepone. Env. Res. 15: 257-267.

Collins, H.L. et al, 1973. Residues of mirex in channel catfish and other aquatic organisms. Bull Environm. Contam. & Toxic. 10:73-7.

Commonwealth of VA., Div. of Consol. Lab. Services. 1979. Chlordecone (Kepone) mirex in metabolites in fish and shellfish. Tech. Prog. 3-122. Richmond, VA.

Connolly, J.P. & R. Tonelli. 1985. Modelling of Kepone in the striped bass food chain of the James River Estuary. East. Coast. Shelf. Sci. 20:349-356.

de la Cruz, A.A. & K.Y. Lue. 1978. General: Mirex incorporation in estuaries animals, sediment, and water, Mississippi Gulf Coast. Pestic. Monit. Jnl. 12(1): 4ff.

Dewitt, J.B. et al. 1961. Effects on wildlife. in: Effects of Pesticides on fish and wildlife in 1960. U.S. FWS Circ.143: 4-15.

Drifmeyer, J.E. et al 1980. Chlordecone (Kepone) accumulation on estuarine plant detritus. Bull. Environ. Contam. Toxica. 24: 364-368.

Eroschenko, U.P. & W.O. Wilson. 1975. Cellular changes in the gonads, liver, and adrenal glands of Japanese quail as affected by the insecticide Kepone. Toxicol. Appl. Pharmacol. 31: 491-504.

Fabacher, D. C. & E. Hedgson. 1976. Induction of hepatic mixed-function oxidase enzymes in adult and neonatal mice by kepone and mirex. Toxical. Appl. Pharmacol. 38: 71-77.

Garnas, R.L. et al. 1978. The fate and degradation of 14c - Kepone in estuarine microorganisms. In: Kepone Proceedings II, EPA-903/9-78-011. U.S. EPA Phila., PA. 330-362.

Good, E.E. et al. 1965. Effects of pesticides on reproduction in the laboratory mouse: I. Kepone. J. Econ. Entomol. 58(4): 754-757.

Hallet, D.J. et al. 1978. Photo mirex - synthetic assessment of acute toxicity, tissue distribution, and mutagenicity. J. Agric. Food Chem. 26(2): 388-391.

Hallister, T.A. et al. 1975. Mirex and marine unicellular algae: accumulation, population growth, and oxygen evolution. Bull Environm. Contam. & Toxicol. 14(6)

Hansen, D.J., et al, 1976. Kepone: hazard to aquatic organisms. Science 193: 528.

Hansen, D.J. et al. 1977. Kepone: Chronic Effects on embryo, fry, juvenile, and adult sheepshead minnow, Cypronito
n variegatus. Chesapeake Science. 18:(2) 227ff.

Holcomb, C.M. & W.S. Parker. 1979. Mirex residues in eggs and livers of the long-lived reptiles (Chrysemys scripta & Terrapene carolina) in Miss. Bull Environ. Toxicol. 23:309-371.

Kaiser, K.L.E. 1974. Mirex: an unrecognized contaminant of fishes from Lake Ontario. Science 185: 523-525.

Kendall, R.J. et al. 1977. Residues in fish, wildlife and estuaries. Pestic. Monit. Jnl. 11(4) 64ff.

Khera, K. E. 1975. Mirex: A Teratogenicity, dominant lethal and tissue distribution study in rats. Food Cosmet. Toxical. 14: 25-27.

Kobylinsky, G. J. & R. J. Livingston. 1975. Movement of mirex from sediment and uptake by hogchocker. Trinectes Maculatus Bull of Environm. Contam. & Toxicol. 14(6)

Legget, T.A., Jr. 1979. The development of blue crabs, Callineates sapidus, from Kepone contaminated eggs. M.S. Thesis, College of William and Mary, Williamsburg, VA.

Lowe, J.C. et al. 1971. Effects of mirex on selected estuarine organisms. Trans. 36th No. Amer. Wildl. Nat. Res. Corp. 171-186.

Ludke, L.J. et al. 1971. Toxicity of Mirex to Crayfish, Procambrue blanding. Bull Environ. Contam. Toxicol. 6(1): 89-96.

Lue, K.Y. & A.A. de la Cruz. 1978. Mirex incorporation in the environment: toxicity in Hydra. Bull. Environm. Contamination & Toxicology. 007-4861/78/0019-0412.

MacFarland, L. Z. & P.O. Lacy. 1969. Physiologic and endocrinologic effects of the insecticide Kepone in the Japanese Quail. Toxicol. Appl. Pharmacol. 15: 441-450.

Markin, G.P. 1981. Translocation and fate of the insecticide mirex within a bahia grass pasture ecosystem. Env. Poll. (Series A) 26: 227-241.

Mehendale, H.M. et al. 1973. Fate of 14c-Mirex in the rat and plants. Bull. Environ. Contam. Toxicol. 8:200-207.

Minchew, C.D. et al. 1980. Tissue distribution of mirex in adult crayfish (Procambarus Clerki). Bull Environm. Centam. Toxicol. 24: 522-526.

Moseman, R.F. et al 1977. Electron capture for chromatographic determination of kepone residues in Env. samples. Arch. Environm. Contam. Toxicol. 6: 221-231.

Naqui, S.M. & A.A. de la Cruz. 1973. Mirex incorporation in the environment: Residues in nontarget organisms. Pestic. Momt. Jnl. 7: 104-111.

Nichols, F.H. 1974. Sediment turnover by a deposit-feeding polychaete. Liminol. Oceano. 19: 945-950.

Ohlendorf, H.M. et al. 1981. Orgono chlorine residues and mortality of herons. Pesticides Monitorinq Jnl. 14 (4) 1259.

Ordnoff, S.A. & R.R. Colwell. 1980. Effect of Kepone on estuarine microbiol. activity. Microb. Ecol. 6:357-368.

Provenzano, A.J. 1978. Survival, duration of larval stages and size of post larval of grass shrimp (Palaemonetes puaio) reared from kepone contaminated and uncontaminated populations in Chesapeake Bay. Estuaries: 1:239ff.

Roberts, M.H., Jr. & R.E. Bendl. 1982. Acute toxicity of Kepone to selected freshwater fishes. Estuaries: Vol. 5 (No. 3): 158-164.

Robinson, A.M. & J.D. Yarbrough. 1976. Liver responses to oral administration of mirex in rats. Pest. Biochem. Phys. 8: 65-72.

Schimmel, S.C. et al. Kepone Toxicity and Bioaccumulation in Blue Crabs (Contribution No. 349. Env. Res. Lab., Gulf Breeze, Fla.) 1979. Estuaries: Vol. 2, No. 1. (Mar. 1979).

Shea, J.C. et al. 1981. Accumulation and retention of mirex by brook trout. Bull Environm. Contam. Toxicol. 27:79-83.

Smith, J.C. & F.S. Arant. 1967. Residues of kepone in milk of cows receiving treated feed. J. Econ. Entimol. 600(4): 925-927.

Strik, J.J.T.W.A. et al. 1980. Toxicity of photo mirex with special reference to porphyria, hepatic P-40, and glutathione levels, serum enzymes, histology, and residues in quail and rat. Bull. Environm. Contam. Toxicol. 24: 350-355.

Togatz, M.E. et al. 1975. Seasonal effects of leached mirex on selected estuarine animals. Arch. of Environ. Contam. and Tox. 3: 371-383.

U.S. EPA. 1975. Fact sheet on kepone levels found in environmental samples from the Hopewell, VA area. Health Effects Lab., RTP, No. Carolina.

Van Valin, C.C. et al. 1968. Some effects of mirex on two warm water fishes. Amer. Fish Coc. Trans. 97: 185-196.

Villeneuve, D.C. et al. 1979. Short-term toxicity of photo mirex in the rat. Toxicol. Appl. Pharmacol. 47: 105-114.

Walsh, G.E. et al. 1977. Toxicity and uptake of kepone in Marine Unicellular algae. Chesapeake Science. 18:222-223.

Walsh, G.E. et al. 1982. Toxicity and uptake of kepone in marine unicellular algae. Chesapeake Bay Sci: 16:222-223.

Ware, G.E. & E.E. Good. 1967. Effects of insecticides on reproduction in the laboratory mouse. II. Mirex, Telodrin, and DDT. Toxicol. Appl. Pharmacol. l0:54-61.

Wheeler, N.B. et al. 1977. Mirex residues in non-target organisms after application of 10-5 bait for fire ant control, northeast Fla. 1972-74. Pestic. Monit. Jnl. 11:146-156.

Wolfe, J.C. & B.R. Narment. 1973. Accumulation of mirex residues in selected organisms after an aerial treatment, Mississippi 1971-72. Pesticides Monitorina Jnl. 7:112-116.

Yarbrough, J.D. et al. 1981. Comparative study of 8-monohydromirex in male rats. Toxicology and Applied Pharmacology 58:105-117.

ATTACHMENT 2
SUPPORTING TECHNICAL DATA FOR DEVELOPMENT
OF A 10 PPB CLEANUP CRITERIA

EPA selected the following general assumptions in developing the cleanup criteria:

- Reasonable assumptions for such considerations as lipid content of worms and soil total carbon values were developed to support the conservative approach rather than factored in ways to give less conservative answers.

- Endpoints were developed from tissue level studies when available rather than gross studies that cannot be used in developing NOAELS OR LOAELS.

- The maximum or the 95% UCL of data was assumed, especially when a relatively low number of samples is involved.

- The conservative risk assessment approach uses additive effects based upon the assumption that the habitat reacts as a whole to contamination, with some receptors more susceptible than others, but all comprising whole.

- In screening level risk assessments, a factor of 10 is used in developing potential for risk to related species (e.g., bird-to-bird) and a factor of 100 for unrelated species (e.g., fish-to-bird).

- Levels of mirex as low as 1 ppb inhibit photosynthesis of some phytoplankton; some soil microorganisms are adversely affected at 0.01 mg/kg. Chronic toxicity manifested by irritability, loss of equilibrium, hepatomegaly, reproductive failure, paralysis, induction of mixed function oxidase, and mortality may occur after long exposure.

An example of the application of these conservative assumptions to the kepone exposure model for the American Robin is presented on Table 1. The assessment demonstrates that the reasonable worst case indicates serious potential for risk.

The risk assessment is the basis for determining the target cleanup level for risk management and based upon the EPA Region III screening level risk assessment approach, the cleanup level could be extremely low. The recommended target cleanup level of 10 ppb is based on information from the RI coupled with a revised toxicological evaluation originally presented in the risk assessment and some compromises dictated by technology and economics. The screening results are as follows:

An screening level risk assessment shows a potential for risk at 1 ppb and if the uncertainty factor of 100 (applied to protect unrelated species) were to be factored in, a cleanup target of 0.001 ppb would be recommended.

- The reasonable worst-case scenario shows a potential for risk at about a factor of 10 which would still make a case for recommending less than 1 ppb as a target cleanup number.

The above values are unreasonable from a technological and economic perspective. The target cleanup level of 10 ppb is based upon the judgement that the greatest amount of cleanup will be achieved for a reasonable investment and still yield an acceptable degree of protection. It is preferable to cleanup to a level protective of the most sensitive receptors, but the appropriate level of information was not provided. In such cases, the most protective cleanup numbers that are economically and technically feasible are recommended.

TABLE 1

KEPONE EXPOSURE MODEL FOR AMERICAN ROBIN

(Kepone in soil :g/kg)(daily intake) + (kepone in soil :g/kg)(soi
=:g/kg/dy
(body Wt. of robin)

Environ's factors:	0.0087 kg/dy	= daily intake
	0.0008 kg/dy	= incidental soil ingestion
	0.078 kg	= body Wt. of robin
	BAF	= 8.82 (earthworm kepone BAF)

RISK TO AMERICAN ROBIN

FACTOR	ENVIRON	R W
Diet (LOAEL)	50 ppm1	
LOAEL to NOAEL	0.2 = 10 ppm	x
Uncertainty Factor (UF) LOAEL		
UF for inter-species uncertainty	none	
Toxicity Threshold3	1000 :g/kg/dy	2
Kepone in soils (:g/kg)	53	
Earthworm Lipid Level (% Wet Wt.)	0.85	
Soil Organic Carbon (%)	5	
Earthworm BAF	8.82	
Avg. Oral Exp. (:g/kg/dy)	52.7	
Ratio Exposure to Threshold	0.05	

Notes on assumptions:

- Lipid Content: A citation from the Environ ERA, Lawrence and Mill content of earthworms is about 1.5%, a much more conservative (but
- BAF: site-specific soil organic carbon average is reasonably esti from 8.82 to 31.1.
- Average oral dose: this is based upon the higher BAF.

1 From DeWitt et al. 1962 (as used in Environ's March '94 ERA).

2 From McCall & Eroschenko. 1988. (Cited in Environ's Dec. 12, 1994

3 March 1994 ERA cited information that ring-necked pheasant ingeste Wt. on a daily basis. Worst case assumes same for Japanese quail, McCall & Eroschenko (1988). This may be a good estimate for the A